Rock Products

CEMENT and ENGINEERING NEWS

Volume XXX | Chicago, January 8, 1927 | Number 1

A by-product of a city quarry operation—The reinforced-concrete pipe plant of George C. Bartram, Inc., Buffalo, N. Y.—with the quarry of the Buffalo Crushed Stone Co., whence comes the aggregate for the pipe, in the background

Work of the Nonmetallic Mineral Station of the Bureau of Mines During 1926*

By Oliver Bowles

Superintendent, Non-metallic Minerals Station of the Bureau of Mines, in co-operation with Rutgers University, New Brunswick, N. J.

THE Nonmetallic Minerals Experiment Station of the U. S. Bureau of Mines was organized at New Brunswick, N. J., on July 1, 1923. The present technical staff of the station consists of Oliver Bowles, superintendent; W. M. Myers, mineral technologist; E. E. Berger, chemist, and J. F. T. Berliner, chemist. The full staff of the station is shown in the accompanying photograph, which includes also Dr. Dorsey A. Lyon, formerly acting director and now supervisor of experiment stations and chief metallurgist. During part of the year Marie Farnsworth served as chemist. The work of the regular staff was supplemented also by the temporary services of a consulting chemist and a consulting mining engineer. The station maintains offices and laboratory in the Ceramics Building, Rutgers University, New Brunswick, N. J. In February, 1926, all the nonmetallic work of the Bureau of Mines was placed under the general supervision of the New Brunswick station. This arrangement tends to promote unity in the work, to prevent overlapping, and to bring to bear on each problem undertaken all the accumulated knowledge available.

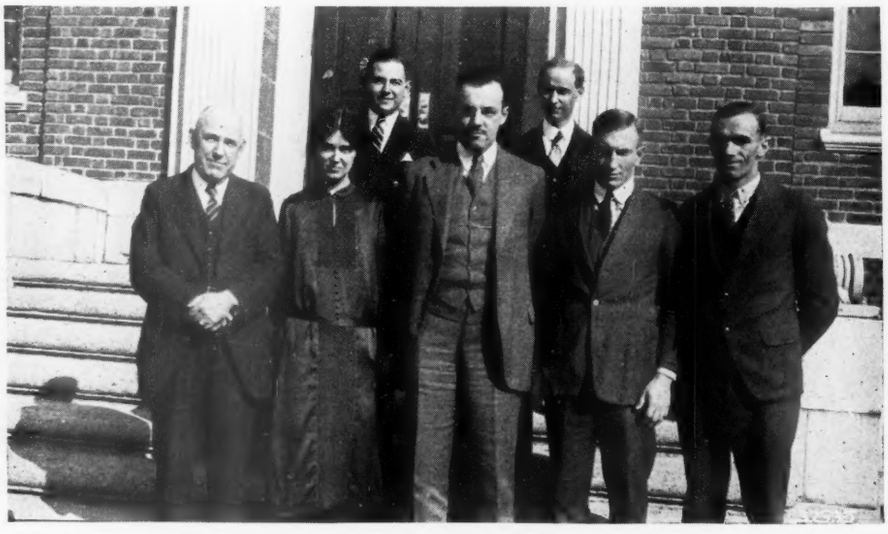
The office of the station is to conduct research and to provide informational service to the great group of nonmetallic industries, the chief of which are cement, lime, gypsum, stone, sand and gravel. These industries, extending into every state in the Union and providing products having an annual value running into hundreds of millions, have in the past enjoyed the benefit of very limited research. As may be judged from the preceding paragraph, the small personnel which the station can afford is entirely inadequate to meet the needs in so extensive a field. It is the policy of the station, therefore, to choose those problems the solution of which will be of most benefit to the industries served, the choice to be governed to quite an extent by the demands of industry and by the cooperative effort that may be expected. As will be shown later in greater detail, the work at New Brunswick is supplemented by the conduct of nonmetallic problems at several other experiment stations. Some of the problems, particularly those requiring the application of chemistry and physics, are worked out in the laboratory. More general studies of mineral industries and many problems having to do with equipment and operations in the mines, quarries and mills, are conducted as field studies.

Oliver Bowles, superintendent of the experiment station at New Brunswick, New Jersey

The chief laboratory problem at New Brunswick during 1926 had to do with the effect of steam in the lime kiln. Much uncertainty exists in the lime industry regarding the effect of having a steam jet beneath the grate. Opinions differ as to the advantage to be gained, and of those who claim to find it advantageous some attribute the benefit to better draft conditions, some to improved combustion, and others to a definite chemical reaction between the steam and the limestone promoting calcination.

With so much conflict of opinion in an operation of such importance in the lime industry, it seemed desirable to conduct experiments which would definitely establish the facts and thus pave the way for a more rational conduct of this particular phase of lime burning. An electric furnace was employed for calcination, the heat being under exact control and accurate measurement. Much difficulty was experienced in obtaining conditions in an air current and in a steam current that would be exactly comparable in every respect. Apparatus was finally perfected so that all physical difficulties were overcome, and results were attained which permitted a reasonable interpretation of the effect of steam in the kiln. These results are not yet in completed form for presentation. The work was under the immediate direction of E. E. Berger, physical chemist.

A laboratory problem which centered in New Brunswick but which was conducted entirely at Massachusetts Institute of Technology,



The permanent staff of the New Brunswick station in 1926 together with the supervisor of stations. From left to right: Dorsey A. Lyon, supervisor of stations; Mrs. Henry J. Spille, principal clerk; J. F. T. Berliner, chemist; W. M. Myers, mineral technologist; Oliver Bowles, superintendent; E. E. Berger, chemist; Fred Spille, laboratory helper

*Published by permission of the Director of the Bureau of Mines.

Cambridge, Mass., was an X-ray study of limes having different plasticities. Excellent X-ray facilities are available at Cambridge and the bureau was kindly permitted to use them for this work. A second problem which was begun at New Brunswick and completed at Cambridge was a determination of the cause of deterioration in plaster of paris when used repeatedly. It was found that the increasing weakness was probably due to traces of uncalcined plaster causing differences in crystallization. The addition of small percentages of certain salts greatly increases the strength of the reused plaster. Complete results of these studies will probably appear shortly in the *Journal of Industrial and Engineering Chemistry.*

Lime Burning with Sintering Machine

The results of the bureau's two years work under the direct supervision of W. M. Myers in adapting the sintering machine to the calcination of limestone spalls were published as Report of Investigations Serial No. 2762.† It was pointed out that lime of good quality can be made with the sintering machine and that fuel ratios compare favorably with those obtained in ordinary practice. The sintering machine offers several advantages over the rotary kiln, the most important of which are low investment, low maintenance expense, and simplicity of operation. Further experimentation under plant conditions will be required before the apparatus can be perfected. Several operators are giving serious consideration to plant tests.

Producers of metallurgical limestone are for the most part unfamiliar with the application of stone at the furnaces, its fluxing action, effects of impurities, or the qualities demanded for different ores and different types of furnaces. On the other hand, the furnace man is commonly unfamiliar with the nature of limestone deposits and the many problems that confront the quarryman. In view of these conditions the superintendent of the New Brunswick station undertook the preparation of a report covering both utilization and preparation of metallurgical limestone, its purpose being to coordinate these two interested groups, and to place before them the major problems that confront each group. Most of that section of the report dealing with utilization has been completed.

Quarrying for Lime Manufacture

A report on quarry problems in the lime industry was completed by Oliver Bowles and W. M. Myers in 1925, but owing to delay in printing it is not yet available. Its appearance as Bulletin 269 is expected within the next two or three months.

The bureau issued a report on mica a few years ago, and the demand for it has been so great that the supply is practically exhausted. Sheet mica finds many uses, particularly in the electrical field, while ground mica finds wide use in wallpaper, prepared roofing, and as a filler. The wide interest in mica led W. M. Myers to undertake a detailed study of both mining, manufacturing and utilization problems. Practically every operating mine and mill has been visited, not only in the most productive states, North Carolina and New Hampshire, but also the scattered mines and mills in the Middle Western, Southern and Western States. A laboratory study of the flocculation of fine-grained mica suspended in water was completed in November.

†See ROCK PRODUCTS, pp. 53-59, July 24, 1926.

Circle cutting drill in operation at a slate quarry

Potash Explorations

One of the final acts of the last Congress was to appropriate $100,000 a year for the next five years to be used by the U. S. Geological Survey and the Bureau of Mines to prospect for potash in Texas. Traces of soluble potash salts found in drilling for oil led to the expectation of finding deposits similar to those occurring in the famous Stassfurt beds of Germany, and the purpose of the new appropriation is to provide for a systematic search by drilling. As a requisite of this problem the need arose for complete and detailed information on the German and Alsatian potash deposits, their mode of occurrence, geology, mining and treatment. To J. F. T. Berliner, physical chemist of the New Brunswick station, was assigned the problem of compiling a complete bibliography and abstract of all foreign literature relating to this subject. The work was begun on October 1.

Sawing Slate from Quarries

The wire saw has been used with success in European quarries, but has never been tried in American slate quarries. It consists of a ¼-in., 3-strand wire cable of special composition and design which runs as an endless belt. When pressure is exerted by the traveling cable against the solid rock, and when it is fed with sand and water, it cuts a channel in the slate by the simple process of abrasion. When cutting into the solid quarry ledge it is necessary to have an open bench of some sort at either end of the cut where the standards bearing the sheaves over which the cable runs may conduct the cable as it cuts its downward course. If faces are not presented they must be provided. Equipment for this purpose consists of a circle cutting drill which is simply a rotating cylinder that cuts out a drum or column of slate 30 in. in diameter. Thus a 30-in. hole is projected 6 to 12 ft. below the surface, and the standard carrying the sheaves is placed in it. The circle cutting drill is shown in the accompanying photograph.

The channeling machine now employed as the standard equipment for cutting out masses of slate in the quarry has a number of disadvantages, among which are its high cost, its slow rate of cutting, and the fact that it "stuns" or fractures the slate for a distance of from 1 to 2 ft. on either side of the cut. The wire saw is not costly, and it has no stunning effect on the rock. Its rate of cutting is yet to be determined.

The desirability of proving the worth of the wire saw led to the bureau to urge that it be tried in the American quarries. With the cordial cooperation of several slate companies a complete equipment was purchased from a Belgian firm that specializes in its manufacture. The equipment was set up and placed in operation at the Colonial Slate Co. quarry near Pen Argyl, Penn., late in the autumn. It has been operating so short a time that no report is yet available as to the cost or rate of cutting. J. R. Thoenen, who wrote Bulletin 262, now in press, on underground limestone mining, is in immediate charge of operations in Pennsylvania.

The bureau is making no promises regarding the success of this innovation. If successful it may mark a new era in slate quarry operation. If unsuccessful no heavy loss will ensue, and even negative information has some value.

Other Nonmetallics

As mentioned previously, increasing interest is manifested in technical research directed toward the great group of nonmetallic mineral industries. On this account studies have been undertaken mainly of commodities occurring in the near vicinity of the cities where the stations are located. A brief record of the principal tests undertaken follows.

In cooperation with the University of Washington a survey was made by the

Northwest Station at Seattle, Wash., of the high grade clays of the Northwest, and a report on the subject prepared. New apparatus for washing the impurities from high grade clays was devised and constructed. Several test runs gave satisfactory results. A report with illustrations is in manuscript form.

The clay-like mineral bentonite is a source of great interest to many industries. Its properties of de-inking newsprint paper, of purifying oils, and its many applications as a filler have led to considerable study of its properties and uses. The Intermountain Station of the bureau at Salt Lake City undertook an investigation of its properties and uses, and has prepared a report covering all present available information on the subject.

In cooperation with the New Brunswick station, detailed studies were undertaken at the Mississippi Valley Station at Rolla, Mo., to determine the best type of apparatus for use in the concentration of fluorspar ores, so as to make better recovery of fine fluorspar, much of which now goes to waste in the tailings. A complete analysis of the ores was first made by sink-and-float methods with heavy liquids. A new long-cell jig was devised and has proved so successful that several companies in the Rosiclare, Ill., districts have remodeled their mills and have installed the type of apparatus recommended by the bureau. A great improvement in recovery is reported.

Bauxite, the hydrous oxide of aluminum, is usually classed with the metallic ores because its chief use is for aluminum manufacture. However, it also finds wide use as a nonmetallic in the manufacture of such products as aluminum chemicals, abrasives and refractories. Arkansas is the chief source of bauxite, though supplies are also obtained in Alabama, Georgia, Mississippi and Tennessee. The rapid depletion of high grade ores has aroused increasing interest in the extensive deposits that are too impure for utilization under present methods. This led the Southern Station of the bureau at Tuscaloosa, Ala., to undertake a study of methods whereby the low grade ores might be concentrated by removal of a large percentage of their content of silica, alumina, iron, and titanium. The Southern Station is excellently equipped for ore-dressing research.

Reference Library

The New Brunswick station maintains informational files on all nonmetallic mineral subjects. Information is constantly sought by visitors and through correspondence, and an important function of the station is to supply, whenever demanded, as complete data as possible on deposits, markets, prices, production, methods of operation, machinery and equipment, uses, and related information.

Many conferences are held with trade association groups to discuss problems in their respective industries. Close contact has been maintained during the past year with

Ceramics building at Rutgers University in which the bureau station is located

the National Slate Association, the National Lime Association, and the National Crushed Stone Association. The bureau is now cooperating with the safety and welfare committee of the last named organization in its campaign for greater safety in quarries and crushing plants.

The nonmetallic committee of the Institute, of which the superintendent of the New Brunswick station is vice-chairman, arranged for a program of papers constituting a nonmetallic session at the annual meeting of the A. I. M. E. in New York in February. The session was well attended and an increasing interest in nonmetallics was manifested.

Elasticity and Rupture Moduli of Some Gypsum Mixes

IN "poured-in-place" construction work, where calcined gypsum is used as the cementitious material, it is common practice to mix from 12% to 15% by weight of wood filler with the gypsum. A number of measurements have recently been made at the bureau to determine the effect of the amount and type of filler on the moduli of rupture and elasticity of "first-settle" and "second-settle" gypsum. The scope of the work was not sufficiently broad to be all inclusive, but it is felt that the results obtained are of interest in indicating the magnitude of these values with the mixes employed.

Four brands each of "first-settle" and "second-settle" gypsum and two kinds of wood filler, one a shredded cottonwood fiber, the other wood chips, were obtained as representative of the industry. Three specimens were made of each neat gypsum and three specimens of each gypsum when the filler content was varied by 1% increments, from 12% to 15% by weight of the dry mix. The mixes were cast in wooden molds, so as to produce specimens 3x3x30 in. With the neat mortars the testing consistency of the American Society for Testing Materials* was used. When the wood fiber or chips were added it was found impracticable to use this consistency, so the mixes were made so as to pour readily. The specimens were dried in the laboratory for 14 days before testing.

The table below is a summary of the results obtained.—*Technical News Bulletin*, U. S. Bureau of Standards.

*Standard methods of testing gypsum and gypsum products, Serial Designation C26-23, A. S. T. M. Standards, p. 775; 1924.

EFFECT OF AMOUNT AND TYPE OF FILLER ON MODULUS OF ELASTICITY AND MODULUS OF RUPTURE OF GYPSUM

Kind of gypsum	0	Wood fiber (percentage of filler) 12	13	14	15	Wood chips (percentage of filler) 12	13	14	15
Modulus of Elasticity (lb./in.²)									
"First-settle" calcined gypsum	409,000	199,000	158,000	113,000	79,000	192,000	158,000	129,000	92,000
"Second-settle" calcined gypsum	511,000	201,000	157,000	139,000	108,000	213,000	153,000	139,000	112,000
Modulus of Rupture (lb./in.²)									
"First-settle" calcined gypsum	324	142	112	71	59	158	117	83	65
"Second-settle" calcined gypsum	299	167	144	109	86	156	116	97	77

Rock Asphalt in 1925

KENTUCKY, in 1925, maintained its rank among the states as the chief producer of native asphalt, with sales of 286,850 short tons of bituminous rock, valued at almost $2,500,000, according to statistics compiled by the Bureau of Mines, Department of Commerce. Texas, with 204,530 tons of bituminous rock, was second in quantity, a position that it held in 1923 and 1924. As in 1923 and 1924, Utah was the only state to produce bitumens other than bituminous rock, and sales of 39,520 tons of gilsonite and 270 tons of wurtzilite, valued at $767,900 and $18,400, respectively, were reported. An increase in output and in the average value of its products enabled Utah to pass Texas and to resume its rank as second to Kentucky in total value.

Production of bituminous rock, which is used for road building, was reported in 1925 from Alabama, California, Kentucky, Oklahoma and Texas. Missouri, which entered the ranks of the producers in 1924, made no production in 1925. Production and value for the United States in 1925, as measured by sales at the mines, increased 4% and 2%, respectively.

The entire output of gilsonite, used chiefly in the manufacture of paints and rubber substitutes, was from Utah. The quantity increased 10% and the value 27% in 1925.

Wurtzilite, sold frequently under the name "elaterite," was also produced in Utah only. This material is used mainly in paints, as a filler for rubber, and in roofing. The quantity produced in 1925 was virtually the same as in 1924, but the value decreased 24%.

Detailed information in regard to the asphalt industry in the United States is contained in the Bureau of Mines report, "Asphalt and Related Bitumens in 1925," by G. R. Hopkins and A. B. Coons, which may be obtained from the Superintendent of Documents, Washington, D. C., at the price of 5 cents.

Rubber in the Rock Products Industries

Particular Reference to the Qualities of Rubber Which Make It an Economic Abrasion-Protective Covering

By B. W. Rogers
Sales Engineer, B. F. Goodrich Rubber Co., Akron, Ohio

IN the chemical industry one of the foremost process problems is the protection of receptacles and equipment from the deleterious effects of corrosion. Existing conditions have led to the development of stoneware, vitreous linings and metal alloys with the necessity of accepting inherent disadvantages such as fragility, excessive cost, lack of flexibility and undesirable bulkiness. The corrosion-resisting quality of rubber has been known to chemical process engineers for a number of years, but its extensive use has been delayed due to the lack of suitable means of attachment to metal. The advent of the Vulcalock process has solved this problem, and rubber is now used extensively as a construction material in the chemical industry for lining tanks, tank cars, pipe fittings and other equipment exposed to the inroads of corrosion.

The history of rubber for abrasion-resisting service has been somewhat parallel to the corrosion application, in that certain grades of rubber were known to have abrasion-resisting quality, but the field was not developed until a recent concentrated effort to introduce specially compounded rubber in forms acceptable to the requirements of the trade.

It may be difficult for some to realize that a piece of soft resilient rubber will show a greater resistance to abrasive wear than hard steel. The rubber tire and skid chain afford one of the most common and striking examples of comparison, and those who are familiar with this combination know that the hard alloy steel links when exposed to bare brick or concrete pavement will wear to a point of failure within a few hundred miles, while the tread of a good tire will travel thousands of miles absorbing impact and friction without showing an appreciable amount of wear.

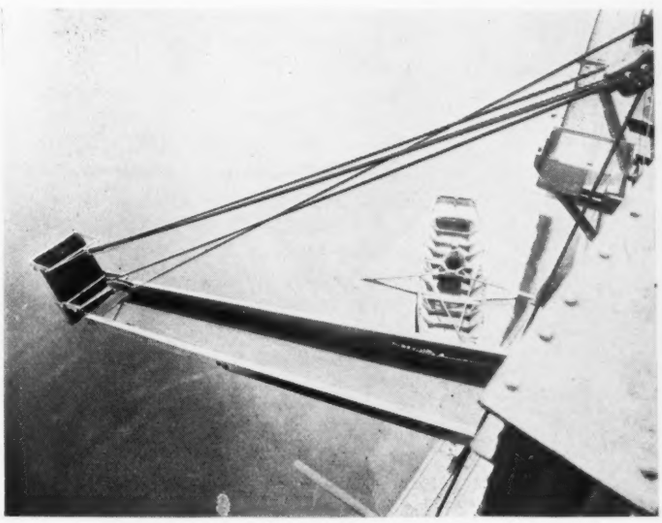
Rubber-covered conveyor and elevator belts have gained recognition as being an important factor in sand, gravel and rock-handling operations, and the success of the belts is largely dependable on the tough cushion of rubber, which protects the carcass from the severe combination of impact and friction. The frugal mine or quarry superintendent can see in the worn and discarded fragments of these belts a material of real utility and the means of reducing maintenance cost. A survey of the industry will show that it is quite common practice to use belt fragments which still have a rubber surface, for all manner of linings where abrasion is present to a destructive degree.

In isolated districts material costs increase in proportion to transportation charges, and as a matter of economy it is often necessary to select light high-grade materials and some of the foreign mining operations have found that it is most advantageous from a delivered cost point of view to substitute a pound of rubber for 10 or more pounds of steel to be used for the same purpose.

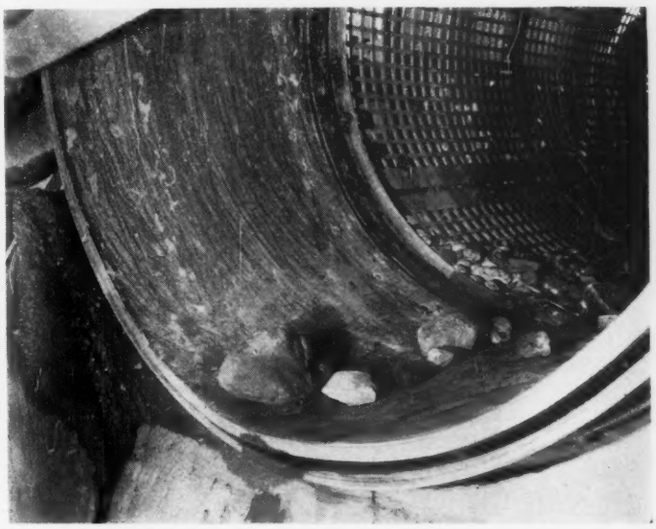
The use of raw sheet plantation rubber and its rather crude application, toward the alleviation of abrasion problems on the tin dredges of Malaya, is unique and shows considerable initiative on the part of local operators. Results of some tests which recently came to the attention of the outside world are quoted in part from the *India Rubber Journal* of London, September 25, 1926:

"The discovery of a new use for rubber right at its principal source of production is naturally of importance, but the fact that it unites rubber with Malaya's other chief industry—tin-mining—gives to it a much greater interest than attaches to most "new uses." This new use has been announced by T. M. Kinnear, engineer to the Sungei Besi Mines, Ltd., near Kuala Lumpur, F. M. S. Crude rubber straight from the plantation factory is being employed by Mr. Kinnear to line the dredge pipes of tin dredges. As Malaya is the greatest tin-producing country in the world, it will be seen that the discovery will have a wide application at the seat of rubber production.

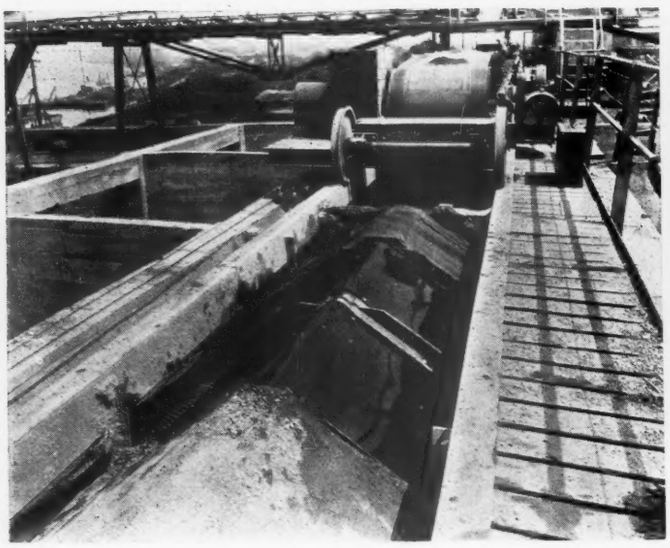
A well-known authority, commenting on this use of crude rubber, says: "It is quite astounding how crude rubber stands up to the abrasive action of gravel, stone, etc." It is believed that many dredge masters in Malaya and Siam have for some time past—possibly for years—been employing this material to withstand the abrasive action to which many parts of the dredge are subjected, but hitherto little or no publicity has been given to the matter.



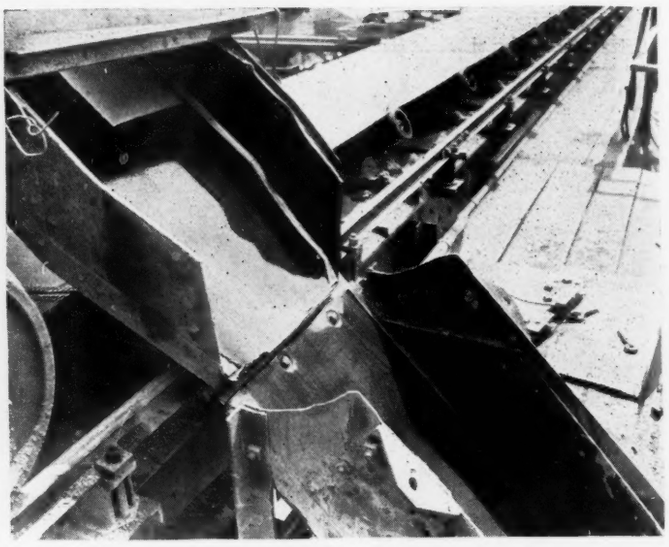
Barge loading spout lined with rubber strips



Blind end of rotary screen lined with sheet rubber



Dividing peak at conveyor discharge to gravel bins—surface is protected by rubber sheets



Rubber bottom and side liners on chute taking coarse discharge of rotary screen on a gravel dredge

Mr. Kinnear states that three rubber-lined pipes, each of 9 in. internal diameter and length of about 20 ft., have been in continuous operation on the discharge line from an 8-in. gravel pump at the Sungei Besi Mines for a period ranging from 18 months from the date of the first pipe's installation. These pipes have been subjected to a continuous flow of gravel, amounting to about 17,000 cu. yd. of solids a month, and a working pressure of about 17 lb. per sq. in. The three pipes, although differing somewhat in design, are all alike regarding the successful results of the rubber applied to them, there being scarcely any evidence of wear or abrasion on the rubber after its long period of operation. The life of a lap-welded mild steel pipe 5/16-in. thick on the same line, with frequent turning to insure even wear, does not amount to an average of seven months.

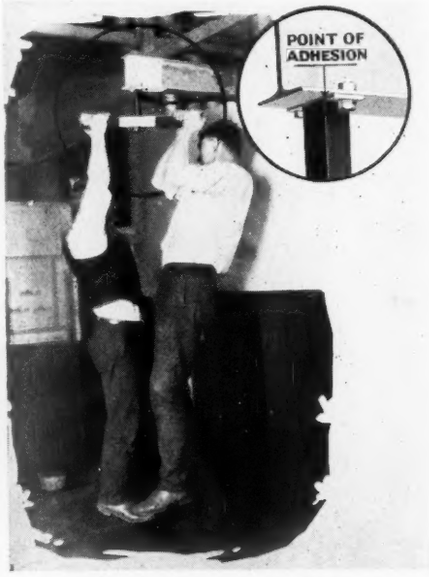
Crude rubber was used only because of its availability. The same amount of crude rubber could have been compounded and cured in one of our American factories to produce a finished product of greater abrasion-resisting quality, and in a form better adapted to the requirements of the service.

It has been the aim of chemists and rubber process engineers to discover a method of attaching soft rubber to metal, more securely than the adhesion afforded by cement or glue. A mechanical anchorage can be effected between a metal surface and hard rubber and in turn an adhesion between the hard and soft rubber, but this method is not considered altogether satisfactory from the standpoint of cost and the lack of flexibility. Through a process of elimination and an accumulation of experience the laboratories of a large Akron rubber manufacturer have discovered a process which permits of soft rubber being applied directly on a smooth metal surface. Adhesion between the two materials is so complete that they appear to be integral, and the bond approaches the tensile strength of the rubber itself. Adhesion tests have been made to show a strength in excess of 700 lb. tensile to the square inch. The end of a rubber strip with 1-in. cross-section area was attached by the Vulcalock process to a smooth piece of steel plate, and the strength of this bond was demonstrated by supporting weight of two large men without any sign of failure. This new process has been found successful also in attaching rubber to other metals, such as brass and aluminum, also to wood and concrete.

A New Structural Material

The Vulcalock process brings into use a new industrial material which incorporates the strength and workability of steel with the desirable abrasion and corrosion-resisting surface of rubber.

The rubber covering of odd-shaped metal parts require that they be sent to the rubber factory. However, flat sheets in mill sizes with rubber covering of any thickness are available and can be cut, bent and worked in the field much as sheet metal.



Demonstrating the adhesive strength between rubber and a smooth metal surface

The attachment requires processing the metal surface and special preparation of the rubber stock in its uncured form. The pliable, semi-plastic gum is applied to the metal and cured in place, and it is during the curing operation that the remarkable adhesion is set up.

The only limiting factor of the Vulcalock attachment is heat, and at present its application cannot be conservatively recommended for temperatures over 180 deg. F.

A number of mining, sand, gravel and rock industries have recognized the possibility of rubber to reduce maintenance expense and have co-operated with rubber manufacturers to try out various compounds and constructions under different service conditions. In the mining plants in the west where hard abrasive ore is crushed and ground and transported with water through the process stages to remove the mineral, it is necessary to line or cover all equipment coming in direct contact with the abrasive medium. Rubber is being used effectively in chutes, launders, sand pumps and flotation machines. Where mechanical strength of attachment is not an important factor, rubber can be applied in the field, and several forms of sheet rubber are being offered for this service. Sheet rubber can be procured in any thickness, and can be readily cut to fit the shape of the surface to be protected. A convenient method practiced by some mining companies is to apply hot mastic tar to the wood or concrete and roll the sheet rubber, which has been previously cut to size, on the tar-coated surface before it has time to cool and harden. This method has been found very effective in applying sheet rubber, which is not provided with a reinforced duck backing. Sheet construction

which incorporates one or two plies of fabric back can be nailed in place, as the backing will afford sufficient anchorage for the head of a nail.

River dredge operations working to reclaim building sand and gravel are using

Rubber cutless bearing section for pumps and slurry conveyors

rubber to a very good advantage as a protective covering, and a check of performance records shows a number of phenomenal results. An unsolicited report from the superintendent of a dredge operating in the Ohio river, written to a rubber company that had furnished the test material, is characteristic of the enthusiasm of many operators who have taken advantage of the possibilities of an old material in a new use:

Sand and Gravel Operator's Experience

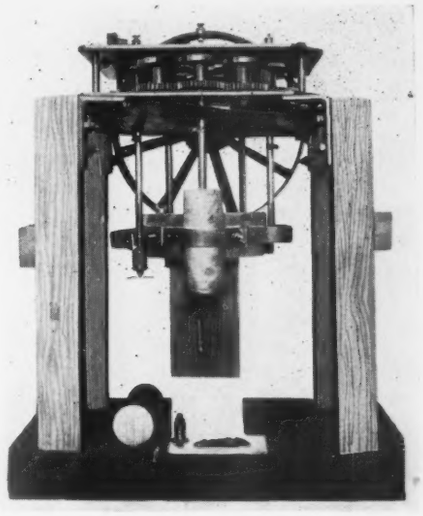
"We have now progressed far enough with your Grade 1162 launder lining that I feel a word is due you in regard to the results that have been obtained. You will remember that last August 1 we made several applications of this material, in ½-in. thickness, on our conveyor system at Louisville, using it as baffle plates in the different hoppers, where the sand and gravel hit it more or less a straight blow (at right angles to its face). We had previously been using ½-in. steel plate, but it 'melted' rather quickly under this abrasive attack and we were glad to try anything that looked as if it would deliver longer service.

"We have now taken off the first of these rubber plates (May 16) and the piece of rubber is such a good exhibit, and we are so well pleased with it ourselves, that I am forwarding it to you under separate cover. There have been 250,000 cu. yd. of sand and gravel thrown against this plate during this period of approximately seven months (we shut down during December, January and half of February). This material was coming away from a 36-in. conveyor belt so you can judge the quantity proportionately. This piece of rubber has done the work of 10 steel plates, but it must be noted that it is not alone the saving of the cost of steel but the labor, shut-downs, equipment, etc., which has been the big saving.

"It is also worth a great deal to know that a plate of this type can be installed and a person can go away and forget it, and devote the time that we once put in watching our hoppers at something else that might be needing our attention. It really is a great feeling and, in short, I am glad to tell you that we would have been happy with a result of even less than 10 to 1. The rubber plate can be turned so easily to a new position that I do not hesitate to say that had we not been trying to see just how far this piece could go before the sand cut through it that this particular piece of rubber could have been easily made to deliver to us 40 times the service of steel plate as we used to install it. We held this piece (1 ft. 10 in. by 1 ft. 6 in. by ½ in.) in place by three 1 5/16-in. by ⅜-in. button-head bolts. It took hardly any labor at all to install it.

"Very early in the life of the rubber plates which we installed last August we could see that the performance was going to be phenomenal. On the strength of this we have since covered all wearing surfaces that sand and gravel come in contact with on our No. 4 digger and our No. 3 digger with similar rubber sheet, with which you are, of course, familiar. These two diggers are all that we operate now. The thickness of these rubber sheets varies from ¼-in. to 1-in., according to the severity of the work to be done. We are equally as well pleased with the performance of this material on these diggers as I have stated above in reference to the baffle plates on our conveyors, especially in the case of No. 4, our new elevator type digger, of which we are very proud and which represents such an investment that we smile when we realize that we have eliminated renewal of steel fabrication next year to an indefinite time in the future which is not worrying us any now.

"I think your new process for attaching rubber to metal bars which we have used to hold the rubber sheet on with is a very great advantage and goes hand in hand with the use of rubber wearing plates.



Machine used to test the abrasion resisting qualities of rubber compounds

"In view of the results which we have obtained with your product in this Grade 1162 launder lining, I feel sure the time is not far distant when the sand and gravel man will use rubber even more extensively than we have done so far. I wish to thank you for the efforts you and your company have put forth in co-operating with us to obtain these very fine results."

Since the early test a demand for rubber

Cutless rubber bearing used to support the propelling shaft of the rotary cutter

coverings has stimulated a desire on the part of dredge builders to incorporate rubber into the original construction which, of course, tends toward an ideal design to accommodate the rubber linings. Such surfaces that are subject to severe abrasion are measured and sheet metal is cut to exact size to cover the area to be protected and forwarded to the rubber industry to be covered with abrasion-resisting stock by the Vulcalock process, the thickness of the rubber depending on the severity of service and the size, nature and fall of the material striking the surface.

Limitations of Rubber

Rubber, being a vegetable derivative, will deteriorate at high temperatures, and its use is not recommended where heat exceeds 180 deg. F.; nor will rubber effectively resist the effect of direct contact with oil or grease.

The abrasion-resisting quality of rubber diminishes rapidly when the stock is placed under tension, and care should always be taken to eliminate a tension condition, if maximum results are expected. Rubber is not recommended to resist the severe impact of large rocks, particularly sharp and angular particles such as are produced by a crusher. The impact of a large piece of rock against rubber, particularly if the section is thin, will throw the surface of the rubber under tension, and make it susceptible to cutting. Impact caused by the falling of material should be compensated for by increase in the thickness of a rubber covering, and at any time material exceeds three-quarters of an inch combining impact tests should be made with small sections of rubber to determine the advisability of considering a large installation.

Quality of Rubber

Rubber, like iron and steel, has a great variation of content and physical properties, and can vary from substances which are called rubber but in reality are made up of reclaim, mineral pigments and a very small percentage of gum to stocks which are composed almost entirely of new first-class crude rubber. Through experimentation it has been found that only certain stocks have a high degree of abrasion-resisting quality, and all of these have a fairly high pure gum content and high tensile strength. Scientific compounding with certain pigments and chemicals and very close control of the cure or vulcanization has produced stocks which are adapted to abrasion-resisting requirements, and for this reason care should be exercised in purchasing rubber for this purpose, and it is advisable to consult those who are rubber experts, in order to take advantage of records and experience.

Rubber Covered Screens

Tests have been made with screens by perforating rubber-covered metal, also with woven rubber-covered wire with very encouraging results. The great diversity of screen sizes presents a problem to the rubber manufacturer which has discouraged the development from the production viewpoint. However, it is probable that present difficulties will be eliminated to a sufficient extent to give the industry a new screening medium with the wearing quality considerably in excess of metal screens.

Rubber Cutless Bearings for Pumps and Slurry Conveyors

Of some thirty-odd thousand different rubber articles made by one concern, one of the most novel and outstanding from the standpoint of proven practicability is the rubber cutless bearing. Those who wear rubber heels and have stepped on a smooth wet metal surface have no doubt demonstrated to their complete satisfaction that water provides a very adequate lubrication for rubber to metal contact, and it might have been such a simple demonstration that prompted the inventor of the cutless bearing to try it in a centrifugal sand pump.

This cutless bearing consists of the metal shell or sleeve lined with a specially compounded soft resilient rubber, not considerably different in texture and hardness from the tread of a cord tire. The primary application of the rubber bearing is in a totally submerged position, such as the stern tube and strut bearings, which support the propeller shaft of a ship, and the bearings of centrifugal deep well pumps and hydraulic turbines.

Aside from the advantage of being able to operate successfully submerged, the rubber bearing shows an unusual ability to withstand abrasion and protects the shaft from scoring when required to operate in gritty water. One of the hardest service conditions that cutless bearings have yet been called upon to meet is that of operating completely submerged in cement slurry in spiral conveyor troughs and in slurry agitators. Reports show that bearings have been operating continuously in this service nearly two years without sign of failure.

The submerged portion of the cutter head shaft on dredges has been a constant source of bearing trouble due to the fact that the bearing is required to operate in water, which always carries a heavy burden of sand and solid matter in suspension. Cutless bearings recently applied to this service promise to give a long life and considerably increase the endurance of the shaft.

The superintendent of a western mining company, who has used rubber bearings successfully in sand pumps, conceived the idea of applying the bearing to the boot shaft of a wet elevator to replace babbitted bearings that had given trouble. The best performance of babbitted bearings ever reported was two months, and had the rubber bearings doubled this life they would have been justified. A report of the installation shows that the rubber bearings have been in service seventeen months, and are still performing. These rubber bearings were not located in a submerged position, which necessitated bringing a water line to the bearing for the required lubrication, and the vent is so arranged to drain into the elevator boot. This demonstration should be of singular significance to the sand washing industry where wet elevators and other moving equipment are at times flooded with water which carries fine sand into the bearings.

The rubber industry as a whole is progressive and always alert to the possibility of introducing new and economical applications of rubber, and it will be found that the engineers who concentrate their efforts on the application of new uses of rubber are always willing to cooperate with the operator in the field toward the solution of problems wherein rubber may be a factor.

Attacking the Tensile Strength Test for Sand

T. C. POWERS, chemist of the department of materials, Oregon State Highway Commission, writes a three-page article in the October number of *Public Roads* to show that the tensile strength test of sand (compared with the same test on Ottawa sand) is not only of small value to show the fitness of the sand for making concrete, but that it may actually pass an unfit sand as fit.

The gist of the argument is that unsoundness in the sand (the point the tensile test is supposed to determine) may not be disclosed because of a better grading of the sand. And he further shows that the very grading which enabled it to pass the tensile strength test may be a disadvantage in the usual arbitrary mix such as is usually specified for highway and other concrete. It may be too coarse to combine with the coarse aggregate used.

He gives the following example to prove the latter point:

Coarse Aggregate	
Fineness modulus	7.50
Maximum size	1½ in.
Fine Aggregate	
Fineness modulus	3.60
Maximum (mesh) size	4

Mix, 1:2:4.

These materials combine to form an aggregate with a fineness modulus of 6.12, while the maximum permissible fineness modulus for this mix and maximum size is about 5.80. The mix is undersanded and should be changed to 1:2.6:3.4 to produce maximum strength. (Note that the percentage of cement used is the same in both cases, the greater strength coming from a better grading of the combined aggregates, which permits a lower water-cement ratio for the same consistency.—Ed.)

The author points out that a sand with a fineness modulus of 2.40 would have been right to use with the coarse aggregate used, but that such a sand would probably have been rejected on account of its fineness, which would have necessitated a greater water-cement ratio.

The article closes with the statement that there is a crying need for a test that will determine the *quality* of sand and the *degree* of soundness apart from other variables.

Buildings No. 1, No. 2 and No. 3 of the crushing plant. An 800-ft. conveying belt in a tunnel takes the material from Building No. 3 to the screening plant shown on page 44

New Plant of the Tomkins Cove Stone Company at Haverstraw, N. Y.

A Hillside Crushing and Screening Plant Which Includes a 2000-Ft. Conveyor System

THE plant of the Tomkins Cove Stone Co., at Haverstraw, N. Y., the construction of which was recently completed by the Burrell Engineering and Construction Co., is in many ways as remarkable a stone crushing plant as any that has been built. It is a radical departure from the older forms. The design in its main feature, the progression of the material toward the loading point by using conveyors which transport as well as feed the screens and crushers, has been applied in other notable plants in the past year or two. But in addition it uses a gravity flow, and it carries series crushing and series screening rather farther than in any plant that has been noted. To this feature it has added somewhat exceptional storage and loading facilities, so that while the distance from the quarry to the wharf is about 2000 ft., the entire plant forms one unit through which the material moves steadily from the quarry face to the storage silos or the barge.

For seventy years the Tomkins Cove Stone Co. has quarried and crushed limestone at Tomkins Cove on the west bank of the Hudson River 35 miles north of New York. The capacity of this plant is about 5000 cu. yd. per day. The new plant is seven miles down the river, just south of Haverstraw, and will produce 2500 cu. yd. daily. In developing this property the company has been mindful of other than merely utilitarian considerations. The quarry face is located on the back of the Palisades, out of sight of the river, and no effort has been spared to preserve natural scenic conditions. Also, much time and money have been expended to control and keep down the dust which is an inevitable accompaniment of crushing operations.

Preliminary surveys were begun in 1924 by C. T. Allison, county engineer of Rockland County. Early in 1925 S. C. Hulse was engaged as engineer for the company, and a little later the services of L. M. Anderson, draughtsman for the Allis-Chalmers Mfg. Co., were secured. Under the personal direction of Sterling Tomkins, president of the Tomkins Cove Stone Co., the plant was designed and general plans drawn. Toward the end of September, 1925, the Burrell Engineering and Construction Co. of Chicago (E. Lee Heidenrich, junior chief engineer) was awarded a contract for building the plant. Detailed drawings were furnished by the contractor and construction was started early the following December, with O. W. Holmberg in charge as superintendent. The time for the final completion of the plant was about 13 months.

A Hillside Plant

The plant is of the "hillside" or gravity flow type, and the first building called "Building No. 1," which houses the primary crusher, is on the quarry level. This is almost at the top of one of the high bluffs which follow the west bank of the Hudson river for a considerable distance above New York. This level is over 400 ft. above the river. The material flows through the plant in a series of steps. There is a vertical drop before each crushing unit and then a horizontal conveyor that carries the material to the screens and crushers of the next unit in the series. The final screening to the several commercial sizes that are made is accomplished in a long screening plant built on the

The quarry face. Note the smooth road for trucks in front of the face

storage silos. Below these is a tunnel in which is a conveyor system that takes the rock from storage and carries it out to the end of a long concrete wharf where the barges that are to be loaded lie. Except for some local truck delivery, no other method of transportation has been provided, as almost all the product of the plant finds its market in and around New York City, and practically all the concrete aggregate, ballast and similar material that is consumed in the New York area is brought in by water from the point of production.

This plant thus includes one of the largest belt conveying systems for a heavy tonnage of such a material as crushed stone, that has been installed. There was a choice to be made, of course, between this and some other method of getting the rock from the quarry to the barge. The choice of such a conveying system was presumably made after a thorough consideration of other methods, and it was undoubtedly a wise one, since conveyors may be shown to hold their own on a cost per ton basis, when all cost factors are taken into account. In addition, there is the adaptability of the system to the contour of the ground and the important advantage of being able to operate and load material in almost any weather, since all conveyors are either in galleries or in tunnels.

The Quarry

The rock which is quarried for this plant is the well-known New York trap rock, a columnar basalt, the same rock as that which makes the Palisades on the Hudson. Owing to its columnar structure, which is well shown in the pictures of the face, the rock quarries well and breaks to commercial sizes without too much difficulty, in spite of its extreme hardness. The structure of the rock also determines the method of quarrying which is used. Instead of the well drill hole and the big shot which make what is almost the standard practice in the quarries east of the Rocky Mountains, tripod drills and jackhammers (both of Ingersoll-Rand make) are used. Toe and vertical holes are drilled to about 20 ft. depth, sprung several times, and fired with 60% dynamite. From four to six cubic yards of rock are brought down to the pound of powder and very little blocking is necessary.

The stone from the quarry is loaded by two Marion No. 37 electric shovels into 7½-ton Mack trucks, six of these being kept in service. This system of quarry transportation is growing in favor and it is a logical development following the introduction of the caterpillar-tread shovel which does not have to be confined to a railroad track, so it is not surprising that this combination of trucks with crawler-tread shovels should have been adopted when this quarry was

Six 7 1/2-ton trucks, loaded by an electric shovel transport the rock from the quarry to the plant

newly opened. The quarry floor at the face is like a smooth, hard roadway, as the pictures show, and the trucks move over it easily.

The trucks have special bodies, arranged for dumping at the side instead of at the end, as trucks usually dump. They drive into the plant at the quarry level, dump into a hopper above the primary crusher and then out the other side and on to the road to the quarry. This enables them to keep going steadily, without interrupting one another, which is essential where so large a tonnage has to be handled. Trucks coming in from the face take a different road from those going out.

Crushing Plant

Under ordinary conditions, everything that comes from the quarry goes through the primary crusher, but there is a by-pass provided so that the material may be sent directly to the secondary crushers if the jaw crusher is shut down for any reason. And these secondary crushers are so large that they can take all but the largest stones that come from the quarry and hence serve as primary crushers when this is desired.

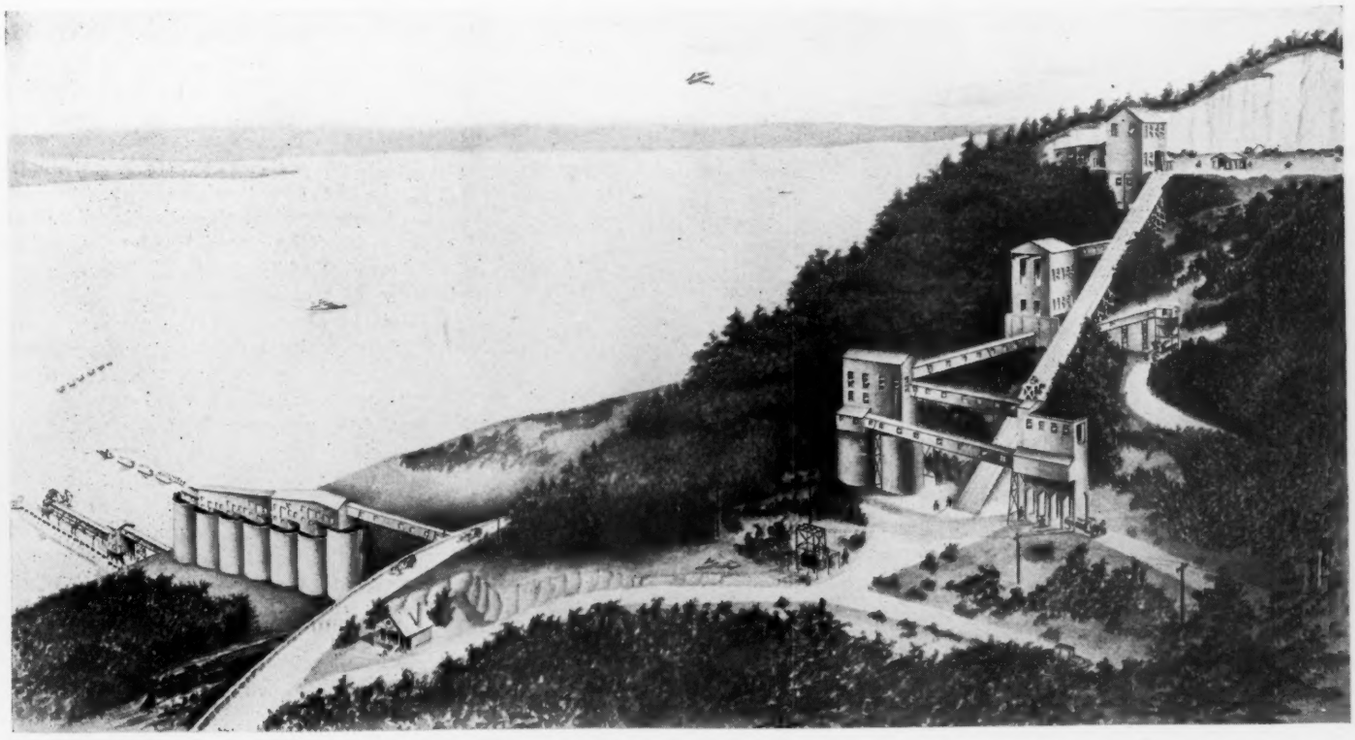
The primary crusher is of the jaw type, and it was made by the Traylor Engineering Co. It has a 48x60-in. jaw opening. The frame is reinforced with forged steel bands around the base and at the top. It is driven by an Allis-Chalmers 200-hp. motor, which runs at 585 r.p.m. through a 24-in. belt, the dive being about 40 ft. between pulley centers, and the crusher runs at 120 r.p.m. The motor is protected by a Westinghouse oil circuit breaker.

Above the crusher is a 20-ton Pawling & Harnischfeger bridge crane, with a 5-ton auxiliary, which was used to place the machinery in position and which will be used to handle parts whenever repairs are necessary. An ingenious arrangement of trap doors allows this crane to drop its hook down to the secondary crushers to pick up parts of these crushers after they have been run out on a track under the trap door.

Toe holes as well as vertical holes are used to break the rock on account of its columnar structure

These secondary crushers are 20-in. Superior-McCully gyratories made by the Allis-Chalmers company. They are set well below the primary crusher and between the two is a steel box or bin which acts both as a hopper and a "stone box," to hold stone on which to break the fall of the crusher discharge and prevent wear.

The method of driving these crushers is



This artist's drawing shows the relative position of the plant units. It includes a bin for truck delivery, near Building No. 3, which is yet to be built

The screening house, 350 ft. long, which is built on the seven 35 by 60-ft. silos. Note conveyor from crushing plant over West Shore R. R. tracks at right

unusual, if not unique as a crusher drive, although it is much used for driving tube mills. Each crusher is driven by a 150-hp. motor which is of the synchronous and not of the usual induction type. The motor is direct-connected to the crusher by a shaft on which there is a Cutler-Hammer magnetic clutch and a flexible coupling. To excite each of these motors there is a 7½-kv. direct-current generator and both motors and exciters were made by the Allis-Chalmers company. The motors run at 360 r.p.m. and

Building No. 1 and compressor house seen from quarry. The electric shovel had just been brought up on the inclined railway and erected when the picture was taken

the exciters at 1730 r.p.m. Other electrical equipment includes Allis-Chalmers circuit breakers and a Wagner Electric Co.'s potential transformer and General Electric circuit breakers and Trumbull safety switches on the exciters.

The discharge of these secondary crushers is fed to a 36-in. conveyor belt which is 187 ft. long, which takes it to Building No. 2. Building No. 2 is equipped with a 5-ton, hand traveling P. & H. crane. The discharge end of the belt conveyor coming from Building No. 1 has a magnetic pulley made by the Magnetic Manufacturing Co. for the removal of any tramp iron small enough to pass the preceding crushers. This conveyor feeds two 60-in. revolving jacketed screens. Throughs from the jackets may be by-passed to a conveyor with the commercial stone or, if they contain any top soil from the quarry, they may be passed over a Hum-mer screen the throughs of which go on a 20-in. conveyor to a bin outside the building. The rejects from the jackets and the throughs from the main screens go to the lower of two 30-in. level belt conveyors, upper 200 ft., lower 220 ft. long, leading to Building No. 3, and the rejects from the main screens go to two 10-in. Allis-Chalmers Superior reduction crushers direct driven by 100-hp. 1200-r.p.m. 2200-volt slip-ring motors. The product from these crushers feeds directly upon the upper of the two conveyors to Building No. 3.

Building No. 3 is equipped with two 5-ton Yale & Towne crawls. The lower belt coming from Building No. 2 carries stone 1½ in. and under and this chutes directly into the second bin beneath the superstructure. Stone from the upper belt feeds into two 60-in. revolving screens the throughs of which pass into the second bin and the rejects go to two 7-in. Allis-Chalmers Newhouse reduction crushers whose product also goes into the second bin.

A New Type of Crusher

These Newhouse crushers are high-speed machines with motors built into their upper parts, and they hang suspended on heavy cables. As this is the first installation of these machines on trap rock, their performance is being watched with considerable interest. By changing the lower plates in the revolving screens in Buildings No. 2 and No. 3, 2½-in. stone may be made and this goes into the first of the two bins under Building No. 3. Each of these bins has a capacity of 500 cu. yd. live storage, and they feed a 30-in., 800-ft. conveyor which starts in the reclaiming section of the tunnel, under the bins.

The drive of the 800-ft. 30-in. conveyor from Building No. 3 to Silo No. 1 is at the discharge end of the conveyor, on top of Silo No. 1.

This belt enters the screening plant which is built on top of the seven 35-ft. silos that are main storage bins of the plant. These are of varying heights, as they are on a hillside and are built to suit both the contour of the ground and the steps into which the screening plant above is divided to suit the flow of the material and accommodate the screens which are used. The silos are set on 56 ft. centers, making the whole row 392 ft. long.

The screening system is a steady progression through a series of screens and inclined belt conveyors taking off the oversize each time. The conveyors from silo to silo are each about 50-ft. centers and on grades of 20% to 30%. When the 800-ft. conveyor brings 2½-in. stone it is deposited directly in Silo No. 1, which has a capacity of 1600 cu. yd. (The other six silos have each a capacity of 1400 cu. yd. live storage.) When 1½-in. and under stone is brought it discharges onto a short 30-in. conveyor belt to Silo No. 2.

On Silo No. 2 are two 60-in. open-end revolving screens which reject 1½-in. stone, and this drops into the silo while the throughs go on a 30-in. belt to Silo No. 3.

On Silo No. 3 are two 48-in. closed-end

The washing plant is in the building at the left. A conveyor runs from it to the conveyor that loads the barges

revolving screens, the 1¼-in. rejects from which fall into the silo while the throughs go on a 30-in. belt to Silo No. 4.

On Silo No. 4 is a Hum-mer 8-ft. single surface screen. This rejects ¾-in. stone and the throughs pass on to Silo No. 5 on a 20-in. belt.

On Silo No. 5 is a Hum-mer screen which rejects ⅝-in. stone and the throughs go to Silo No. 6 on a 20-in. belt.

On Silo No. 6 is a screen the same as on No. 5 but rejecting ⅜-in. stone. The final throughs of screenings and dust go to Silo No. 7 on a 20-in. belt.

The space between silos is available for overflow storage by means of gates near the tops of the silos, and this overflow storage, like that in the silos, is recovered through gates that open into a tunnel beneath in which runs a conveyor belt. This belt runs downhill at an angle of about 10 deg. for 380 ft. and then level for 150 ft. It runs on a steel trestle passing over a public highway and out on to a concrete wharf which is 365 ft. long and 20 ft. wide, to a building in which washing equipment is installed.

Before the wharf was built a basin approximately 300 ft. long and 150 ft. wide was dredged at the inshore end of a channel 100 ft. wide and running straight out into the river 1700 ft. to deep water. Both basin and channel were cut to 12-ft. depth at low water and some 88,000 cu. yd. of material were removed.

Washing Plant

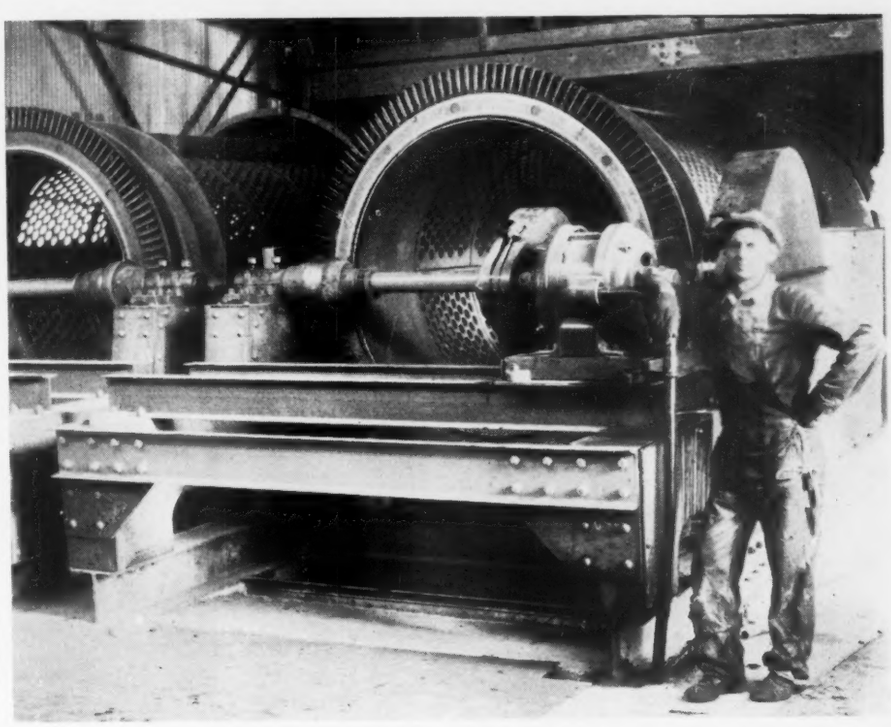
The washing plant is of an original and highly efficient type developed at Tomkins Cove by William Berry and hence known as the Berry washer. The stone drops down a flight of sloping screens and shelves, interspersed by movable baffles which retain enough stone to take all the wear. When these baffles are lowered all the stone goes to the bottom. As the stone descends it is played upon by water at high pressure from rows of small, closely spaced holes in horizontal pipes, which turns the stone over and over and cleanses it thoroughly. The washed stone is fed onto a 30-in., 230-ft. belt conveyor running level over the wharf to the loading boom.

At right angles to the wharf conveyor is a 30-in., 25-ft. belt conveyor, in a counterbalanced frame, discharging into a swivel headed chute which may be so swung as to cover the entire width of a barge. The counterbalanced frame is raised or lowered by motors to suit the stage of the tide. Barges are handled by two lines from a 20-hp. Mundy electric hoist, the lines running through Freidliner swiveled sheaves. Light incoming boats are tied up along a rack upstream from the outboard end of the wharf and, after being loaded, are set directly across the basin against a second rack to await towing to destination.

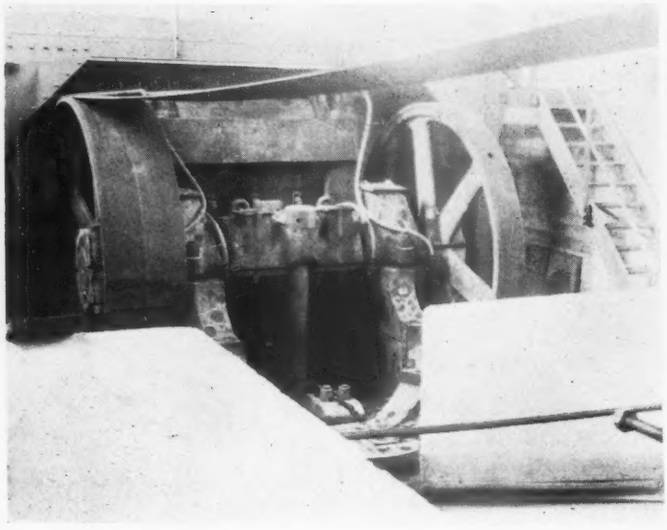
Construction Details

The above gives an outline of the plant with its equipment and the flow of the material through the plant, but the construction is no less interesting. It goes without saying that the entire plant is built of steel and concrete, as practically all up-to-date crushing plants are built. But there are certain features of the construction that are peculiar to this plant and well worth the attention and study of crushed stone operators.

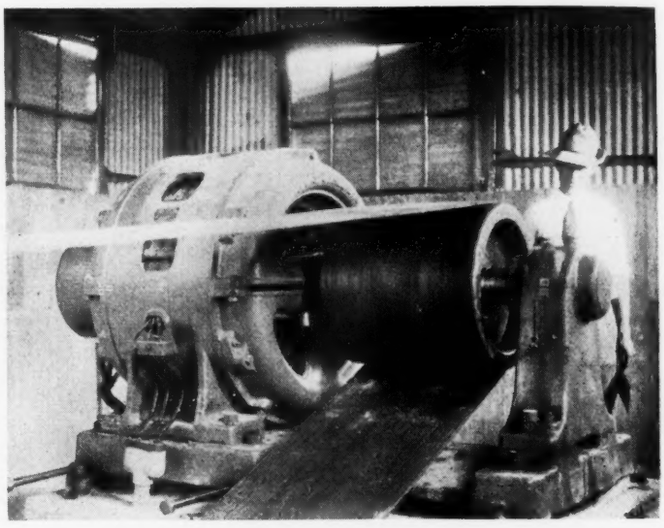
Reinforced concrete was generally mixed



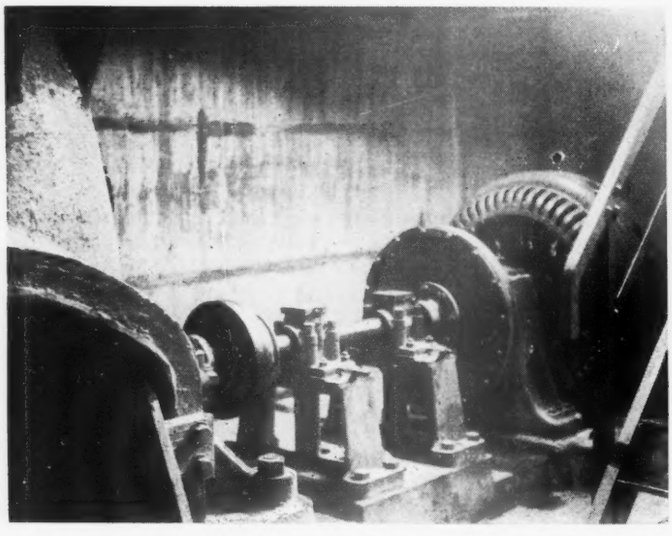
The first screens in the plant, in Building No. 2



The 48x60-in. primary jaw crusher which receives everything that comes from the quarry

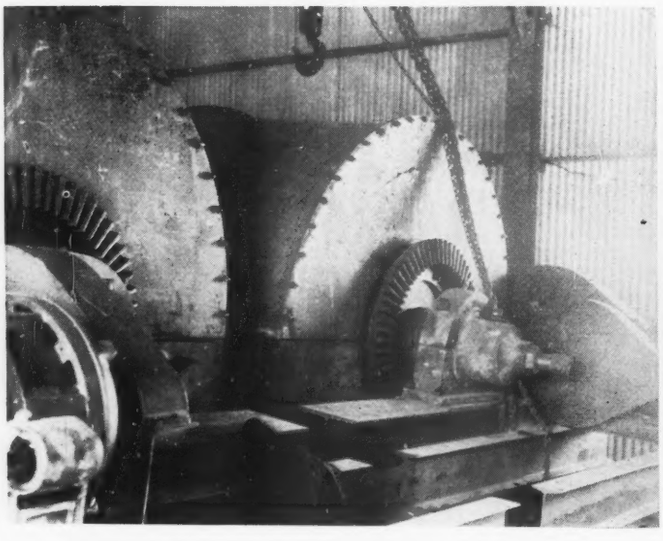


Motor (200-hp.) and belt drive of primary crusher. Pulleys are set about 40-ft. centers.

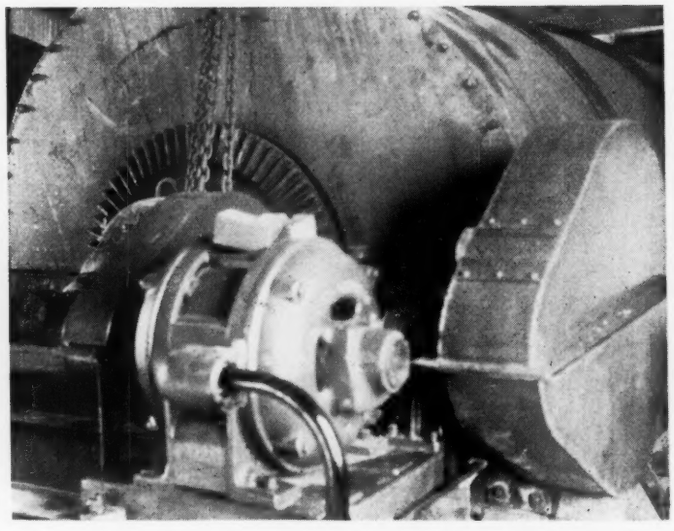


The 20-in. gyratories are driven by synchronous motors through magnetic clutches

Well-built steel stone boxes are placed before all the gyratory crushers



Closed end screens in the screening plant over silos

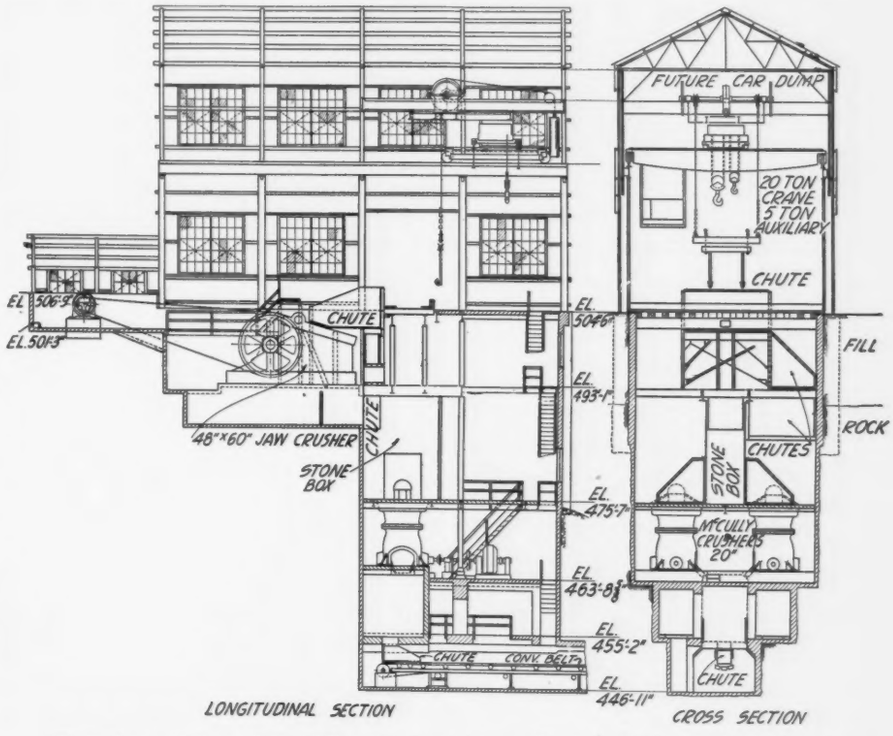


Motor and enclosed gears drive all rotary screens

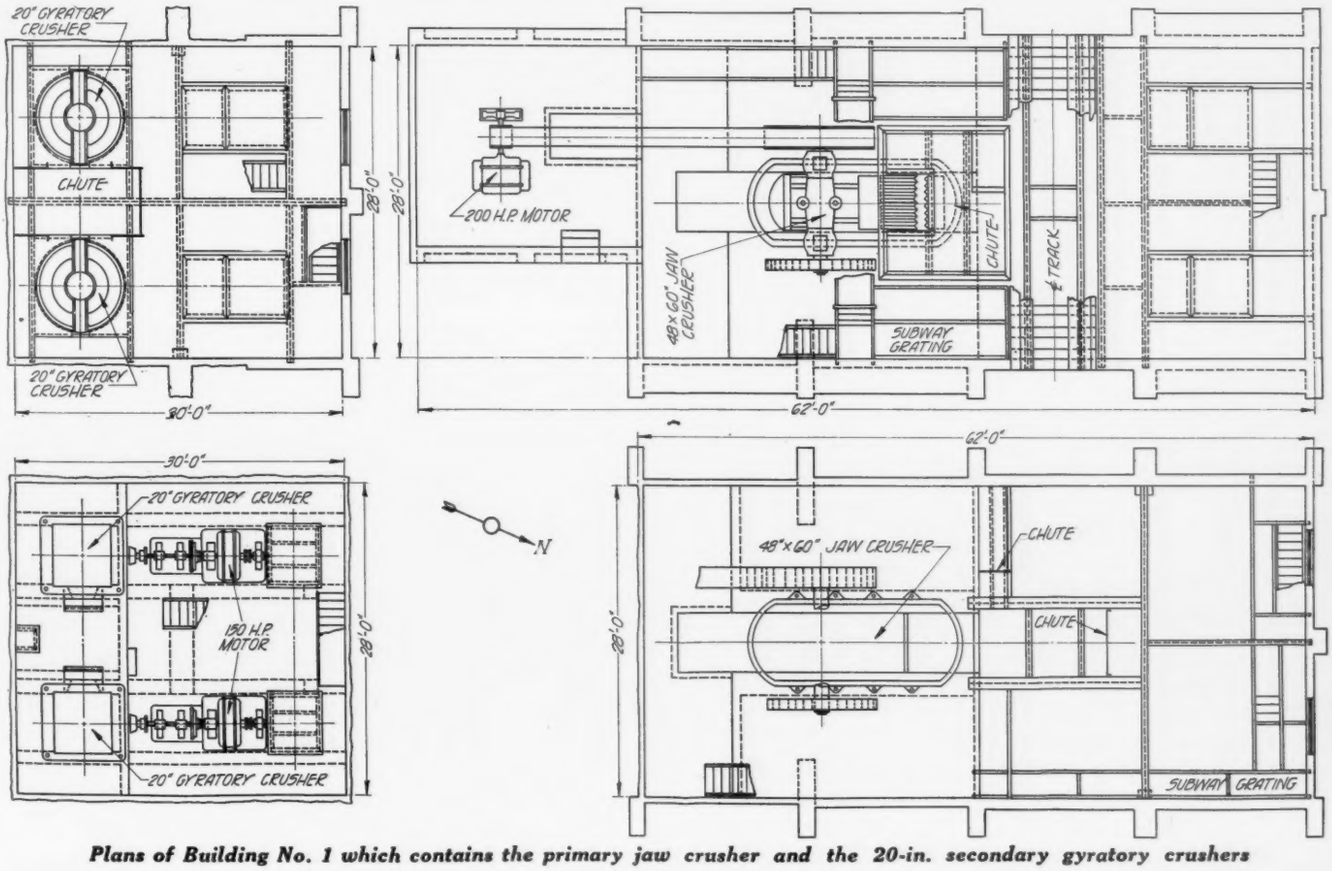
in the proportions of 1:2:4, and plain concrete 1:2½:5. Dragon and Lehigh cements were used equally on the work. The crushed stone came from the company's plant at Tomkins Cove and the sand from a local bank. Reinforcing steel was of rerolled bars. A small amount of Lumnite cement was used in the conduit under the state highway, where extra speed of construction was essential. Test cylinders were regularly taken and tested by the R. W. Hunt laboratory.

There are two horizontal angles in the alignment of the plant, one of 65 deg. where the conveyor from Building No. 2 discharges into the top of Building No. 3, and the other of 16 deg. where the 800-ft. conveyor discharges on top of the first silo. The storage silos and the tunnel underneath rest on clay and gravel foundations. While the general plans were being drawn this ground was thoroughly tested by means of a block of oak 1 ft. square under a gradually applied load up to 4 tons. On both the clay and the gravel it was found that when the full load was reached there was a sudden settlement of 1 to 1½ in., after which no further settlement occurred.

The three crushing buildings are all on rock foundations, there being a very heavy cut under the first, and their lower parts are of reinforced concrete surmounted by steel frame structures sheathed in corrugated iron. Floors are all of reinforced concrete, and subway grating was used for all stair treads. Ample room everywhere is characteristic of the entire plant design. Building No. 1 has a short section of concrete tunnel in front to protect the outgoing conveyor from a heavy fill, the top of which affords a roadway for the trucks hauling quarry stone to the primary crusher. The two upper buildings are rectangular in shape and were poured in built-up forms of lumber. The lower 30 ft. of the lowest building consists of two adjacent silos, and these were carried up together in slip forms of lumber. The permanent incline, equipped with a 40-hp. Mundy electric hoist, was used from the beginning of construction.



Elevation sections of Building No. 1 drawn to about half the scale of the plan



Plans of Building No. 1 which contains the primary jaw crusher and the 20-in. secondary gyratory crushers

House No. 1, in which the primary jaw crusher and the two 20-in. gyratories are housed, is 62 ft. long and 28 ft. wide and 30 ft. from the ground level to the eaves. There is an "ell" on the side toward the quarry, 18 ft. by 20 ft., in which the 200-hp. motor that drives the jaw crusher is housed. The main building is well lighted by large windows, which take up the greater part of the wall space on both sides. Both jaw crusher and motor are set on very heavy concrete foundations, that under the crusher appearing to be about 6 ft. thick.

Steel-built frame and gallery for first conveyor

As the ground falls rapidly here there is ample headroom for a bin or stone box and for the secondary (gyratory) crushers. The jaw crusher is placed below the floor level 11 ft. 5 in. (to the top of the crusher foundations). Below this is a drop of 17 ft. 6 in., most of which is taken by the steel stone box into which the jaw crusher discharge falls. This is 8 ft. by 12 ft. and has two large openings through which the stone flows to the secondary crushers. These are 11 ft. 10 in. high and below this is a further drop of 8 ft. 6 in. through the concrete stone boxes which receive the gyratory crusher discharge. The stone flows out of these through side openings into a steel box above the 36-in. belt conveyor and in the bottom of this box is an inclined chute that delivers the crushed material to the belt.

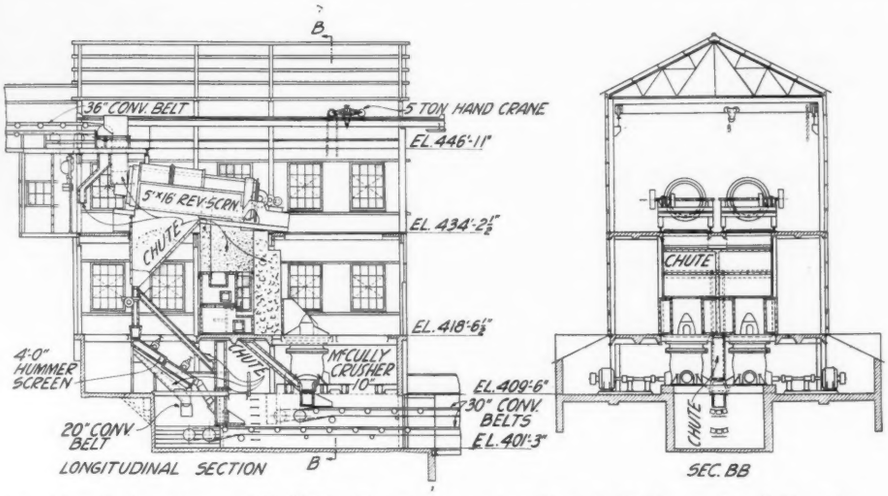
It will be seen that the rapid fall of the hillside has compelled the stone to fall almost vertically for 26 ft., from the jaw crusher to the belt, but this space has been well utilized and the crushers and stone boxes are so arranged that the material does not fall far at any point, that it always falls on a bed of stone and that it flows with no fall from the final chute to the conveyor.

Steel stairways connect the different levels in this building and the treads of the stairs and the platforms are of "Visabledge Safety Step" grating.

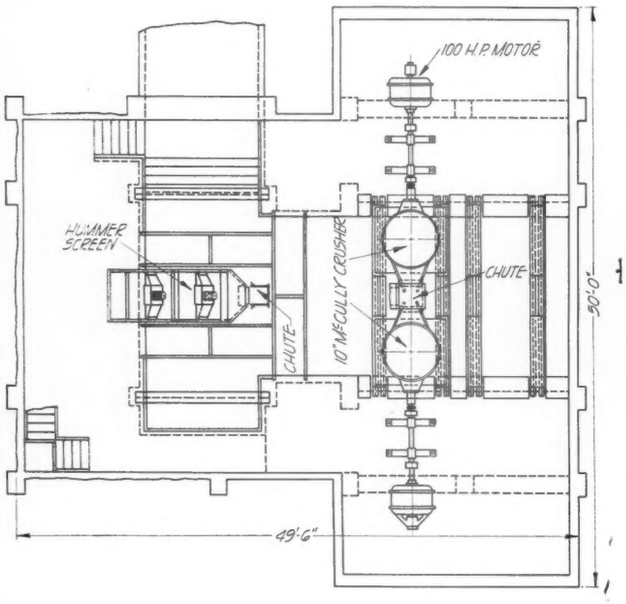
Buildings No. 2 and No. 3

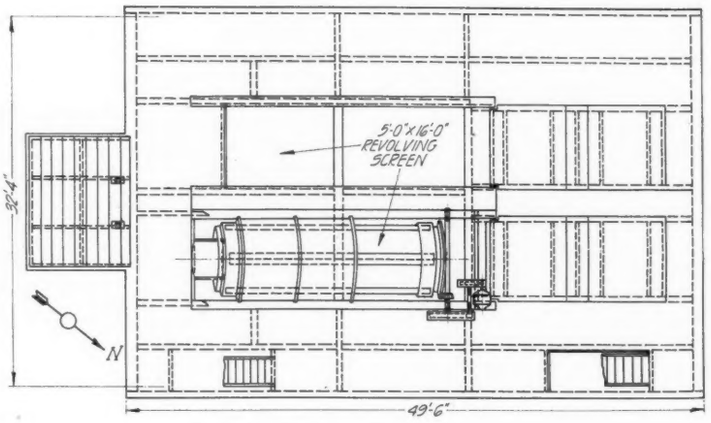
The belt which connects Building No. 1 with Building No. 2 runs in a gallery of steel construction supported on a steel trestle and enters about 50 ft. above the floor level. Building No. 2 is 49 ft. by 32 ft. inside and has three floors. On the first of these are the revolving screens. Below this is a space 15 ft. 8 in. deep in which the "Hum-mer" screen for separating dirt is installed and also a large stone box or chute above the 10-in. gyratory crushers. Below this is the short concrete tunnel, 8 ft. 3 in. deep, in which the two belts run, one for the screen undersize and one for the crusher discharge. The belts run out of this tunnel and into a gallery supported by a steel trestle.

Building No. 3, it will be remembered, is built on top of the two 32x40 ft. silos and it is 48 ft. by 26 ft. inside. There are three floors but the lower floor is only a half floor over one of the silos and below the Newhouse crushers. This type of crusher is suspended rather than supported and it is hung in the floor, which is 8 ft. 3 in. above the top of the silos. The greater part of this floor is supported on posts that rest on the silos. The screen floor is 10 ft. 6 in.



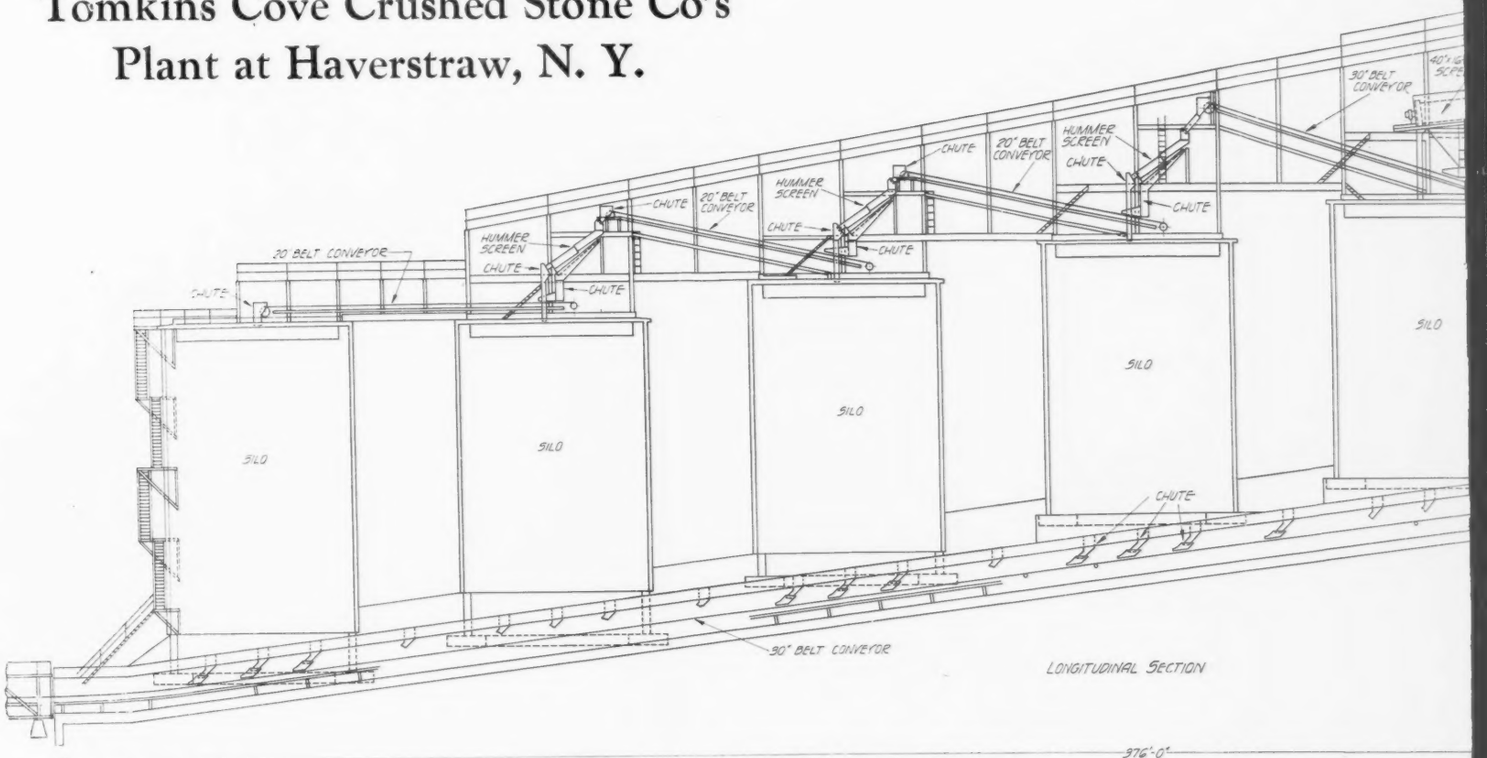
Sectional elevations of Building No. 2 drawn to about half the scale of the plans

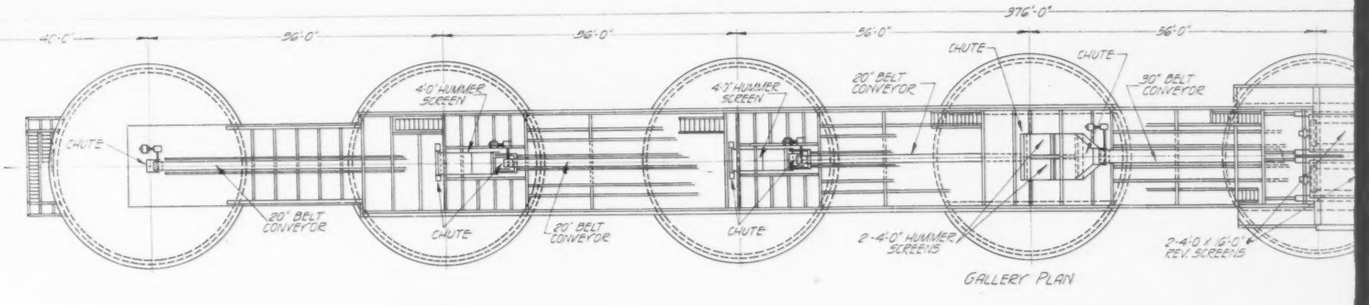


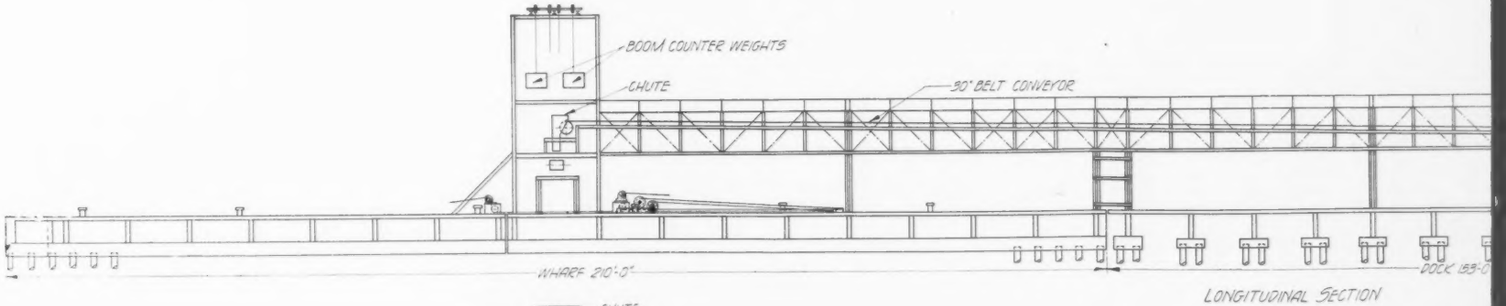


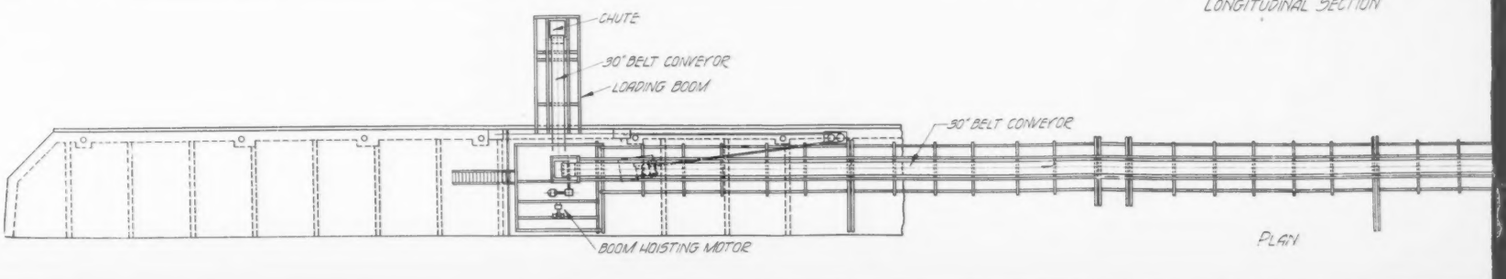
Floor plans of Building No. 2

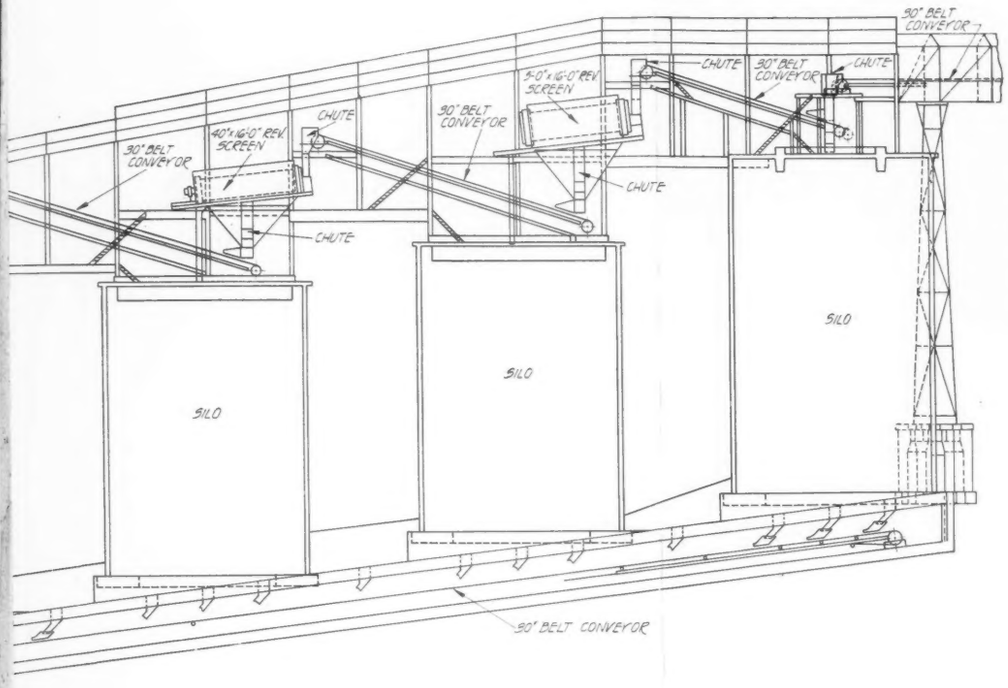
Tomkins Cove Crushed Stone Co's Plant at Haverstraw, N. Y.



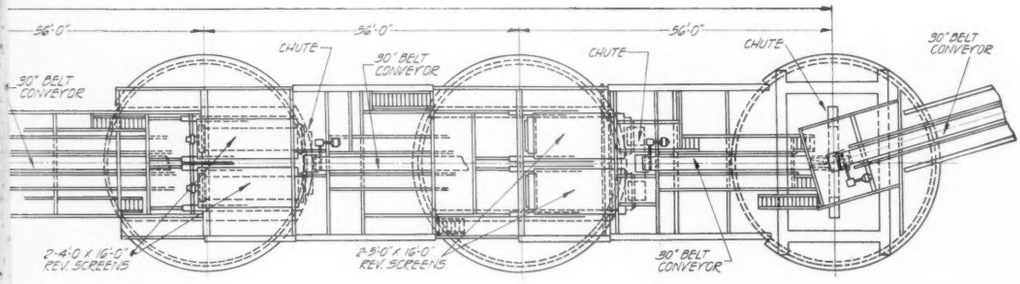


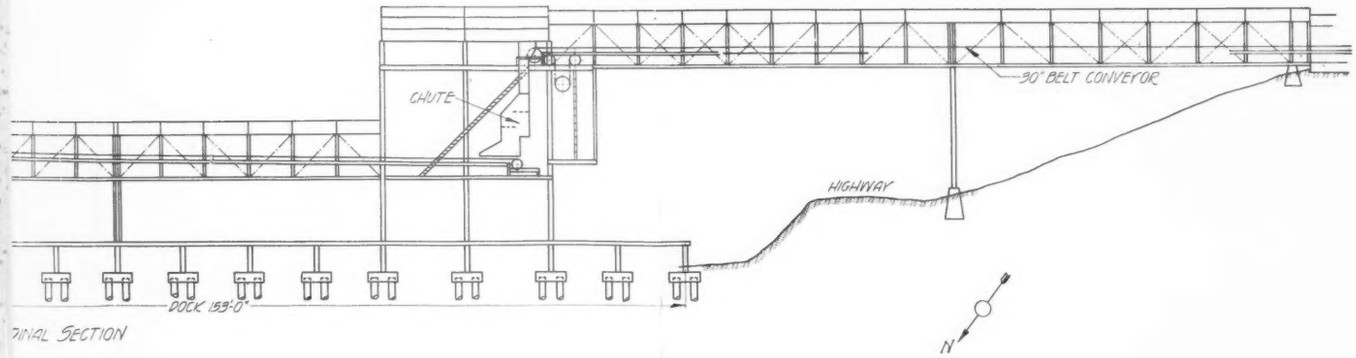




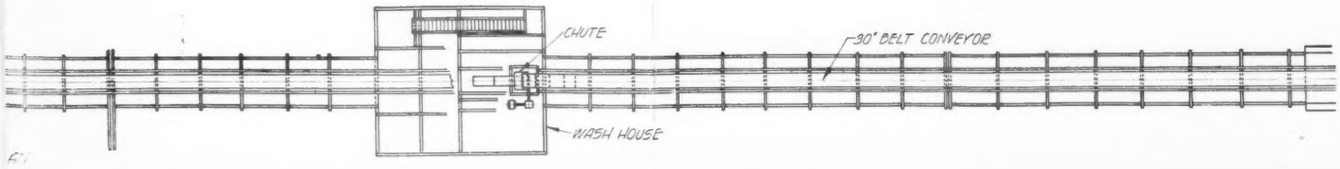


Elevation and plan of storage silos and screening house above; elevation and plan of loading dock with conveying system below. The lower drawings are the same scale as the upper drawings





INAL SECTION



FT

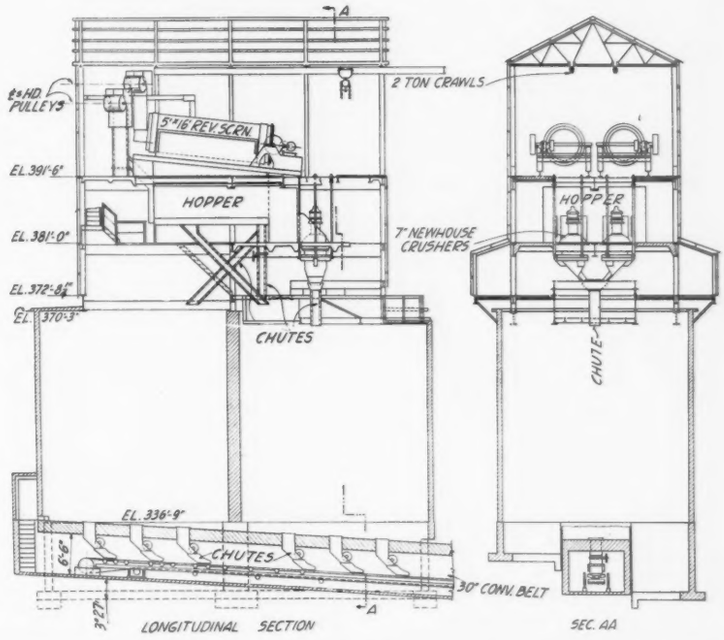
above this. Under this floor is the hopper for receiving the screen discharge which is more like a flat tank since it is 18 ft. long, 12 ft. wide and only 5 ft. deep. But made in this way it runs over both silos and allows room for the chutes through which the screen undersize may be sent to either silo as desired. As these silos each hold around 1600 tons there is ample storage capacity provided so that the screening plant may be kept busy during the time when ordinary repairs to the crushing plant have to be made.

From Building No. 3 it is planned to extend two conveyors to one side to fill bins that will be used for truck delivery to local points. For the present truck deliveries may be made from overflow storage between the large silos by means of a portable loader.

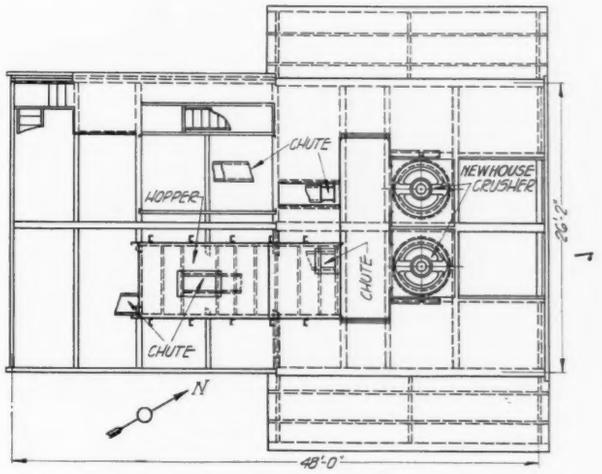
The tunnel in which the long belt to the screening plant runs is 8 ft. high and has room for walkways at the sides, so that it can be easily attended to. After passing out of the highway it runs in a gallery supported at the end in a high steel tower. The gravity take-up for the conveyor is in this tower, which gives the ample travel needed for so long a belt.

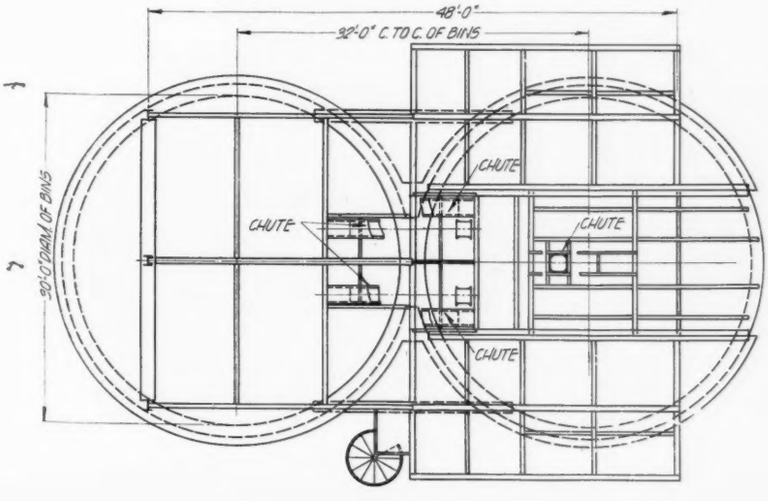
Unusual Method of Constructing Silos

The large silos rest upon ring footings, half on each side of the tunnel, on level benches excavated below the surface only until good ground was encountered. Both the ring footings and the walls were kept entirely independent of the tunnel and each silo sits astride it with ample clearance. The ring footings are 7 ft. wide and 2 ft. thick, heavily reinforced with radial bars, and at least 3 ft. of backfill was put on top of all footings as a protection against frost. Disregarding wind stresses, the maximum load on the foundations is 2½ tons per square foot, and there has not been the slightest evidence of settlement. The silo walls were carried up 8 in. thick by means of slip forms to an average height of 55 ft. The concrete decks on top of the silos carry heavy loads



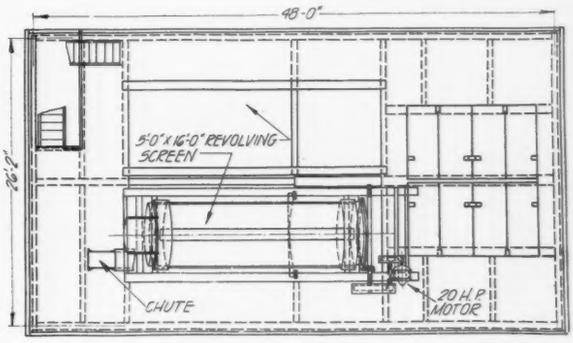
Sections through Building No. 3, bins and conveyor tunnel (half scale of plan)





Floor plans of Building No. 3

of revolving or vibrating screens and each deck with its superimposed steel frame structure is supported by two composite girders of a design worked out by the contractor. The floor on which the deck was poured and which was built as an integral part of the slip form, contained two troughs which formed the lower parts of the girders. When the top was reached, built-up steel girders were erected in these troughs, their ends resting on the now hardened silo walls, and the forms were in turn fastened to and supported by the steel girders, thus obviating any shoring or further support of the girder and deck forms. The girders were heavily enclosed in reinforced concrete, the whole being so proportioned as to deflect together under load, and there is a marked absence of vibration of the silo decks when the screens are running.



The conveying system is so important a part of this plant that it was very carefully studied before the plant was built. All the conveyors were furnished by the Robbins Conveying Belt Co., which co-operated with the plant designers in the engineering required.

Conveyors are all of the three pulley roller bearing type. The belts came from the U. S. Rubber Co. The conveyors are driven through DeLaval speed reducers direct connected to the head pulley shafts, and the 800- and 530-ft. belts, being on considerable grades, have regenerative motors and their tail pulleys are equipped with solenoid brakes.

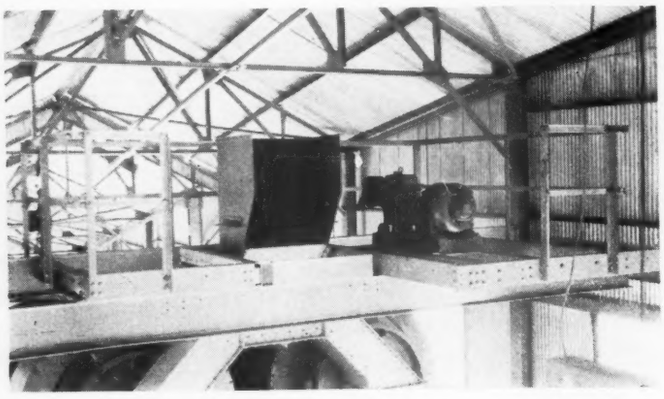
Compressor House

A machine shop and compressor house stands on the quarry level beside House No. 1. It contains two Pennsylvania compressors, each furnishing 1300 cu. ft. per minute. Each is driven through a belt by a General Electric motor. This shop contains the usual machine tools and an Ingersoll-Rand drill sharpener for sharpening the steel used by the X-70 tripod drills and jackhammers.

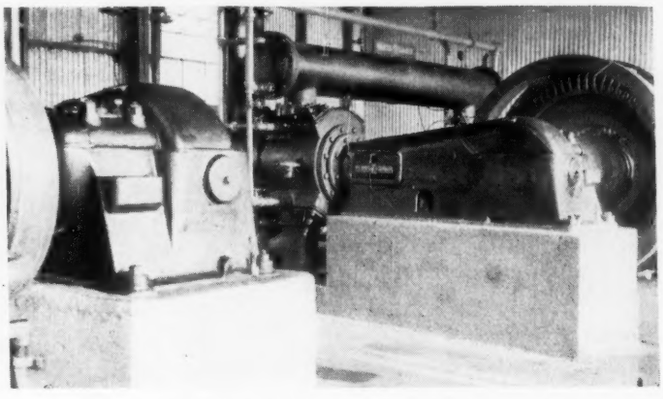
Water for the washer is pumped by a 6-in. Watrous rotary pump with a rated capacity of 1000 g.p.m. at 50 lb. pressure. The discharge of this pump, however, may be varied between 750 g.p.m. at 35 lb. and 1250 g.p.m. at 75 lb. The effluent from the washer is carried through a 10-in. steel pipe line, 1300 ft. long, to a point where none of the solid materials can reach the river. Provision has been made to sluice through this line when desired the screenings and dust from Silo No. 7. Because of salt in the river, water for cooling the air compressors, the primary crusher and the Newhouse crushers are supplied from the city water system by a 2½-in., 4-stage centrifugal pump delivering 100 g.p.m. through a 3-in. pipe line 2000 ft. long, against a 405-ft. static head, to a 30,000-gal. concrete tank near the compressor house. From this source circulating systems are supplied by small centrifugal pumps, one of which is located at a 3000-gal. concrete tank near Building No. 3.

The interior of the whole plant is generously lighted with flood-lights and incandescent lamps. A signal system enables any of the operating force to warn instantly the primary crusher in case of trouble, thus stopping the inflow of stone.

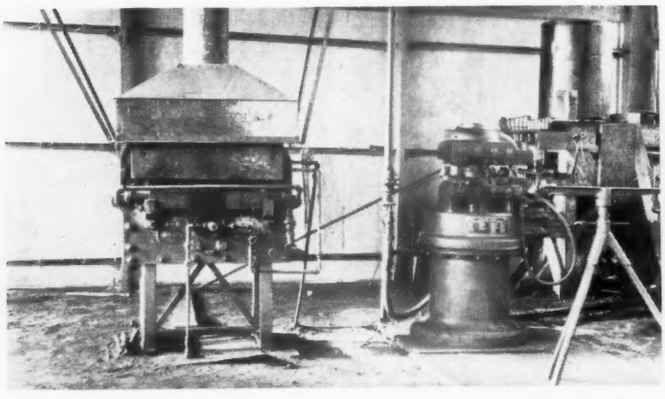
The officers of the Tomkins Cove Stone Co. are: Sterling Tomkins, president; Calvin Tomkins, vice president; H. T. Clews, secretary-treasurer. The company has offices at Tomkins Cove, N. Y., and in New York City.



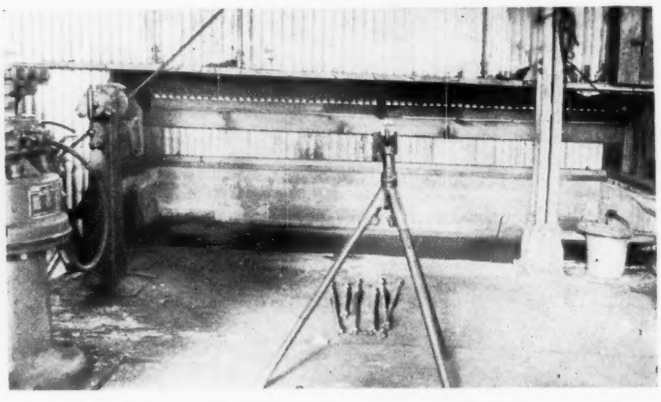
(Taken during construction.) Roof trusses of screening house and conveyor drive



One of the two 1300-ft. compressors which furnish air to the tripod drills



Heating furnace and drill sharpener. The furnace is heated by oil and the sharpener is motor driven



Device for carrying long steel so that it may be easily handled by the sharpener

Canadian Miscellaneous Rock Products in 1925

ACCORDING to a statement issued by the Dominion Bureau of Statistics at Ottawa, production from the 35 plants in Canada classified under the miscellaneous non-metallic mineral products industry amounted in value to $7,978,183 in 1925, as compared with an output value of $6,991,904 in 1924. This industry includes 13 establishments manufacturing artificial abrasives or abrasive products, two plants making graphite electrodes, six concerns producing gypsum products, 11 mica-trimming shops, and one plant making foundry supplies.

Gypsum products made in this industry amounted in value to $1,001,509. Eight plants were in operation capital employed totalled $640,486; employees numbered 213, and materials cost $348,046. Wall coating gypsum board and gypsum blocks were made in three different plants in this industry and the output was valued at $864,583, including hard-wall plaster and some wallboard.

The other main products of the miscellaneous group of firms manufacturing commodities from non-metallic minerals included products of the mica splitting and trimming shops, graphite electrodes and foundry facings and supplies.

Recent Research Developments in Field of Rock Products

By S. S. Steinberg
Professor of Civil Engineering, University of Maryland
Assistant Director, Highway Research Board, National Research Council

THE YEAR just closed has witnessed considerable research activity in the field of rock products—namely, in cement and concrete, crushed stone, sand, gravel and lime—and particularly in connection with the use of these materials in road construction. The application of the results of these studies will insure a more economical expenditure of the enormous sums we are investing annually in our highway improvement program.

These investigations are being conducted by state highway departments, by federal bureaus, by many universities and colleges, and by a number of industrial organizations. The studies are being carried on both in the laboratory and in the field. Following are a few of the more important of the researches initiated or under way during the past year.

Cement Manufacture

To manufacturers of cement the thorough investigations under way on the constitution of portland cement are of special interest. By cooperation of the Portland Cement Association and the U. S. Bureau of Standards, a fellowship has been established at that Bureau for the purpose of studying the many constituents of portland cement, their manner of combination, the effect of each upon cement manufacture, and the behavior of the cement in service.

These intensive investigations are concerned with the complex chemical reactions that take place in the burning of cement in order to determine the influence of varying amounts of certain minor constituents of clinker on the burning temperatures and the completeness of combination of the lime.

This involves a study of the reactions of the several cement compounds with water under the conditions of actual service, and the determination of the influence of each constituent compound throughout a range of compositions on the cement value of the product.

When portland cement is placed in water there occur certain reactions between the soluble substances which are present. As a result of these reactions, there may be formed compounds or structures which are essential or important to the proper setting of the material. There may also result, especially in the presence of waters which contain relatively large amounts of certain soluble salts, reactions which are detrimental to the strength or permanence of a concrete.

Effects of Alkali Water on Concrete

Although many experiments have been conducted on the influence of various salt solutions, alkali waters, sea waters, etc., on the durability of concretes none of these experiments has been conducted in which the individual constituent compounds of cement made into mortars are subjected to the action of salt solutions. Such an investigation is now under way. It is believed that by this means a better understanding may be obtained of the relative resistance to corrosion of the several constituents, and consequently the nature of these constituents which should be present, as well as those which should not be present in cements which may be exposed to such solutions.

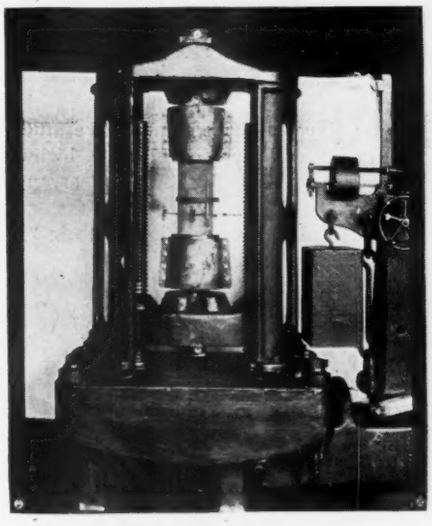


Fig. 1. Concrete tension test specimen at University of Maryland

Structure of Cement Clinker

A study is under way on the structure of cement clinker. An examination is being made of clinker obtained from a large number of representative mills throughout the country, with special consideration of the differences which may result from different types of plant operation and from different kinds of raw materials. In this connection, it might be mentioned that science has not yet identified conclusively even all of the major constituent compounds of clinker, such as are met in portland cement manufacture.

There are indications that the heat given off by cement during the setting processes bears some relation to the behavior of the cement in service. Equipment has been designed by which it is possible to determine both the rate of evolution of heat and the total amount of heat given off by a cement during setting. It is expected that eventually these measurements will give the data by means of which a heat curve may become a measure of cement value.

An interesting adaptation of one of the marvelous developments of modern physics to the study of the constituents of cement, is the use of the X-ray spectra of compounds. These give an insight into the internal molecular or ionic structure of the compound and a knowledge of this structure permits one to predict behavior. A study is being made to learn the effect on these structures of varying proportions of the constituents.

New Data on Concrete

While considerable data have been secured on the strength of concrete in compression, very little is available on its strength in tension. The strength of concrete in direct tension is of particular interest to engineers engaged in the design of concrete roads. Such an investigation has been under way for some time at the University of Maryland, and a similar study has recently been commenced by the Portland Cement Association. By means of parallel compression tests, it has been found that the tensile strength of concrete after 90 days is, on an average, about 1/12 of its compressive strength.

The modulus of elasticity of concrete in tension as compared to that in compression is also being determined. For these observations at the University of Maryland a mirror extensometer is being used that is sensitive to deformations of 2½ millionths of an inch per inch height of specimen. A concrete specimen ready for tension test is shown in Fig. 1.

The greater confidence of engineers in the quality of cement as manufactured today, and the urgent need of using the cement before the 28-day test result can be secured from the laboratory, has given rise to the recent practice, in the testing of portland cement, to accept the material after the 7-day tensile strength has been obtained. A series of studies at the University of Maine has shown that the 7-day tension tests of portland cement is a reasonably accurate means of determining the probable subsequent strength of a cement.

The recent introduction of the American market of "Lumnite" cement has caused a number of research agencies to undertake a thorough study of its properties and characteristics. These investigations are being conducted by many highway departments and universities throughout the country.

A study of bin-storage of portland cement begun by the Portland Cement Association in 1922 will be completed early in 1927. This series of tests constitutes a study of the strength of concrete and mortar at ages of 7 days to 2 years made from samples of cement taken at intervals up to 3 years after storage at mill in bin, and in cloth sacks outdoors under canvas tarpaulin. Parallel tests are being made on the original cement stored at Chicago in wood barrels and cloth sacks in sheds, and in cloth sacks in basement of laboratory, as well as in air tight metal cans. The five-year samples will be tested in January, 1927.

The U. S. Bureau of Public Roads, in co-operation with the state highway laboratories, is conducting tests which have for their object the establishment of the relation between the strength of portland cement as determined by the usual routine tests and the strength of the concrete in which it is used. These tests are of special significance in view of the current agitation in favor of a high-test portland cement for use in concrete road construction.

Fig. 2. Curing test slabs of U. S. Bureau of Public Roads at Arlington, Va., experiment station

During the year a number of studies have been under way on the effect of the use of calcium chloride as an admixture in concrete to accelerate its hardening. Probably the most extensive research on this, as well as other methods of curing of concrete, has been undertaken by the U. S. Bureau of Public Roads at its Experiment Station at Arlington, Va. Fig. 2 shows the 40 concrete slabs, each 200 ft. long. that have been built for this study.

The comparison of "Vibrolithic" and hand-finishing methods of concrete pavements is of considerable interest to highway engineers. Such comparative studies are under way by several state highway departments. Fig. 3 shows the arrangement for testing beams used by the Iowa State Highway Commission in their "Vibrolithic" concrete investigation.

Fig. 3. Testing arrangement, "Vibrolithic" concrete investigation, Iowa State Highway Commission

Studies of Aggregates

Due to the activities of newly organized bureau of engineering of the National Crushed Stone Association, attention has been focused during the past year on the proper use of crushed stone in macadam roads and in concrete. These investigations have also included a study of the commercial sizes of crushed stone and the effect of different percentages of stone dust on the qualities of crushed stone concrete.

The studies on the structural design of macadam roads have been somewhat fundamental in nature and have pointed out; (a) that thorough compaction of the stone layer develops high lateral strength and better wheel-load distribution; (b) that wheel-load pressure on the subgrade decreases as the thickness of layer of surfacing material increases; and, (c) that good subgrade support is required for broken stone roads, thereby necessitating that bad sub-soils be improved by drainage or by admixture of granular materials. Some of the ideas suggested as a result of these studies are now being carried out in the field and give every promise of being successful.

The study of commercial sizes of crushed stone was of a statistical nature and for the purpose of obtaining the consensus of opinion of the stone producers as to their ability to supply stone in accordance with a standard proposed by the American Society of Testing Materials.

During the present year the New Jersey State Highway Department, in cooperation with the U. S. Bureau of Public Roads, began a series of concrete tests for the purpose of studying the relative concrete-making properties of crushed stone and gravel used in road construction in that state.

The program calls for three series of tests. In the first series the workability of the concrete is to be kept constant, as nearly as possible, by means of the flow test, and the relative yield and strength of the concrete determined for each of several gradations both of crushed stone and gravel, using concrete proportions as given in the current New Jersey Standard Specifications. In the second series an effort will be made to design concrete of a

given strength by means of the water-cement ratio theory, for each type and gradation of coarse aggregate. In the third series of tests specimens will be made in which the concrete mixture has been designed in accordance with the fineness modulus theory.

Assuming a constant strength and a constant degree of workability, it is hoped to determine by means of these tests what grading of coarse aggregate and what proportions of fine to coarse will give the greatest yield of concrete for both crushed stone and gravel. The results of this investigations have not yet been made available by the cooperating agencies.

The U. S. Bureau of Public Roads, in co-operation with the Committee on Tests and Investigations of the American Association of State Highway Officials, is engaged in a study of methods for determining the quality of fine aggregate for concrete. The object of this study is to develop a test for the quality of sands which may be substituted for the present unsatisfactory strength-ratio test.

A very elaborate series of tests is being conducted by the bureau for the purpose of studying the effect of type and quality of coarse aggregate on the resistance of concrete to repeated frost action. Concrete beams in which various types and grades of crushed stone, gravel and blast-furnace slag are used as coarse aggregate are being alternately frozen and thawed, their general condition noted and their strength determined at various stages.

Gravel Aggregate

As in the case of the National Crushed Stone Association, the National Sand and Gravel Association has, during the past year, established an engineering and research division in order that that Association might take a more active part in studying the problems of the sand and gravel industry. The most important activities of the engineering and research division thus far have been the correlation of existing test data referring to sand and gravel, particularly in connection with their use as concrete aggregates; in the study of recommendations for commercial sizes of sand and gravel and specifications for these sizes; and in cooperation with research agencies in their studies of sand and gravel.

The effect of shale occurring in coarse aggregates in concrete has been investigated by the Iowa State Highway Commission and by the University of Minnesota. At the latter institution, a study was conducted on the effect of shale pebbles in concrete, and on the removal of shale from gravel.

It is found that the compressive strength of concrete decreases as the percentage of shale pebbles increased. Observations on pavements constructed with shale pebbles in the gravel show that the greater part of the shale comes to the surface, and is removed by weather in a few years leaving surface pits.

A laboratory method of removing shale by using a heavy solution such as zinc chloride, which has a specific gravity between that of the shale and ordinary rock has been developed in this investigation and is now the standard test adopted by the American Association of State Highway Officials. Thus far no satisfactory method has been devised for removing shale at commercial plants although considerable experimenting has been done.

In proportioning materials for concrete, the advantages of measuring the fine and coarse aggregate by weight are becoming extensively recognized, and the "Inundation" method for measuring sand is being more widely used.

Lime in Highway Treatment

A number of experiments on the use of lime on earth roads and for subgrade treatment have been under way during the past year. The purpose of these studies is to determine if lime will stabilize the soil, especially in wet weather.

Tests roads were built by the Wisconsin State Highway Department using a thin gravel surface over the lime-treated subgrade. The University of Illinois built several test sections to determine the value of lime treatment preparatory to oiling earth roads. In Missouri and Iowa sections are being treated with lime to obtain information concerning its use on earth roads without any surfacing materials. In Ohio a short section of subgrade for concrete pavement was lime-treated and earth-lime tests are under way by Ohio State University.

As the result of considerable research by the Asphalt Association, it has been found that hydrated lime gives promise of being particularly well adapted for use as a filler in asphalt paving mixtures both on account of its extreme fineness and its surface texture. It has been shown conclusively that the filler is of major importance in obtaining satisfactory stability, particularly of fine aggregate wearing coarse mixtures. The investigations developed the fact that hydrated lime as a filler in asphalt mixtures produced higher stability values than equivalent amounts of the more commonly used materials.

The many investigations enumerated herein are evidence of the fact that manufacturers of rock products, like those engaged in other industries, are keenly alive to the benefits resulting from scientific research. Users of their products, and particularly those in the highway industry, demand the best that scientific investigation can develop. Science makes known not only better ways in the manufacture and use of a product, but finds many uses never dreamed of before and opens up new markets for the producers.

Ailments Caused by Deficiency in Lime

IN his column which he conducts daily in the *Chicago Tribune,* Dr. W. A. Evans recently made the announcement that scientific and medical research would indicate that deficiency in lime is the real underlying cause for such related ailments as asthma, hay fever, eczema and hives. "Lime shortage," Dr. Evans continues, "is claimed by Dr. Sherman and other medical experts to be the only oustanding mineral shortage in the American diet.

"There have been many efforts to supply this lime shortage which is generally present in cases of hay fever, asthma, eczema and urticaria. It is easy to give lime, but having it absorbed and stored in the tissues is another matter. To make the lime stick to the ribs, physicians use light treatment, codliver oil and extracts of parathyroid and thyroid.

"Drs. Brown and Hunter examined the calcium content of the blood of many people who had asthma or other disorders of this group. They found a considerable lime shortage. They treated their cases on this basis. In the diets used, egg yolks, fresh milk, cheese, whole wheat, bran breads and milk breads, oranges and other fresh fruits, carrots, cabbages and other green vegetables; oatmeal, dried beans, prunes, almonds, walnuts and peanuts were conspicuous.

"In addition, they gave calcium lactate. Others give calcium chloride. Physicians know that calcium lactate and calcium chloride do not act in exactly the same way in lead poisoning, and they may not have exactly the same action in asthma. The Germans make use of lime breads.

"In addition to lime, Drs. Brown and Hunter use thyroid and parathyroid extracts. They give treatment with a mercury vapor quartz lamp twice a week."

Repairing Railroad Concrete

A REPORT of a committee on repairing disintegrated or poor concrete is published in the November issue of *Railway Engineering and Maintenance.* The report divides the work into four classes: (1) Units so poorly constructed that they must be reconstructed throughout. (2) Concrete disintegrated by the penetration of substances from the exterior. The difficulty may sometimes be eliminated by installing drains and by waterproofing. (3) Concrete subject to surface disintegration which may be repaired by removing defective concrete and applying new. (4) Concrete in which disintegration is detected or apprehended and which may be protected by surface coatings to seal the pores or act chemically.

The feature of greatest importance in the report is that the ease with which some repairs to concrete may be effected is well brought out. There is already a technique of concrete repair work and much of this was explained and commented on in the report.

A Survey of the Limestone and Rock Phosphate Situation in the Mid-West Grain States

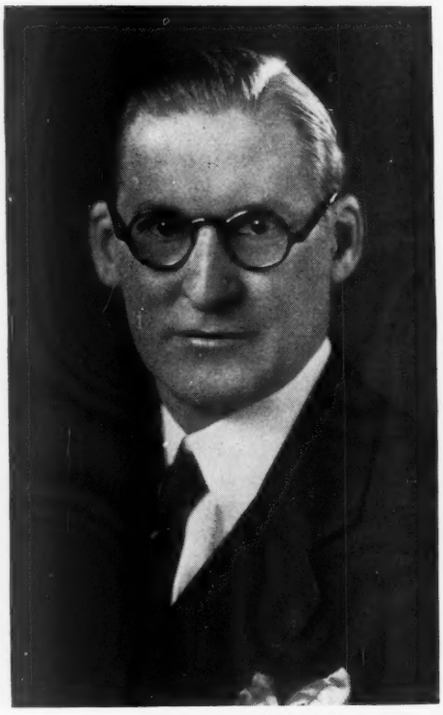
By J. R. Bent

Manager of the Limestone and Phosphate Department of the Illinois Agricultural Association

REVIEWING, year by year, the situation surrounding the production, distribution and use of agricultural limestone, the observer cannot fail to be impressed with the fact that agricultural limestone is becoming more and more a distinct commodity, possessing its own problems in production, sale, distribution, shipment and use. Not only is it the common meeting point for those engaged in quarry operations with those engaged in farming, but it is rapidly becoming more and more prominent as a factor in the affairs of each of these two groups.

It is not many years since quarry operators in the mid-west states considered limestone screenings (sometimes called screen dust) a waste or by-product to be disposed of for any use and at any price available, and that agriculture offered only a limited outlet, not too particular as to quality, for some of this material. Today, most quarry operators consider their agricultural stone to be as much a specific commodity, with its own limiting specifications—physical and chemical—as any of their other products or sizes of stone.

Especially in Illinois, and states east thereof, quarry operators realize that by exercising judgment and care, at the production end, a large portion of their "fines" can be made reasonably profitable and find a ready market for agricultural uses. It has been largely within the last year or two that many operators have adopted the practice of keeping separate the screenings coming from the primary crusher and scalping screen and those produced as a result of secondary and subsequent crushing operations. The reason for this is that the so-called primary screenings carry a large portion of whatever impurities, as may be with the rock as it comes from the quarry, whether such impurities are due to the presence of some overburden material, clay filled fissures in the deposit, or shale seams and pockets. The secondary screenings, being the result of re-crushed larger rock, are much more nearly free from such dirt. There is, and always has been, a more or less fluctuating market for low grade, low priced fine material to be used for railroad fills, yards, secondary road construction, etc. etc. A small amount of clay or dirt is not objectionable in such a product, and by making a separation (such



as just described) both the demand for cheap material and that for a good agricultural stone may be satisfactorily met and a higher average price secured.

From the farmers' viewpoint, agricultural limestone is no longer an experiment. Scoffers have become users, and it seems fairly certain that in the future the use of agricultural limestone will not be limited to the more enlightened leaders, but will progressively percolate on down through all classes of cropping farmers and become an essential factor in their farm management. This does not mean that the day of educational and promotional work has passed. There is still need for the best thought and effort of all such missionary agencies. The State Experiment Stations and Extension Services must continue their research work, but their efforts will more and more take the direction of details and refinements on the scientific side. The Farm Bureaus must also continue as the chief agencies through which these scientific facts are converted into practical farm technique.

State associations of farmers, such as the one the writer represents, must continue to deal with the problems of purchase and sale; quality and inspection service; transportation and distribution, and business relations generally. The agricultural departments of the railroads have rendered valuable service in the past and their help still will be needed; not perhaps so much along educational lines as in the past, but, at least, as friendly contact points between the railroad companies and the farmers in the territory which they serve and which, in turn, contributes to their traffic. Among the quarry operators themselves there is room for service of the trade association character. This may be along the lines of commodity advertising; joint action with farmer organizations, in the improvement of specifications and service and the holding down in every legitimate way of costs in the production, sale and distribution of agricultural limestone.

In the past, soil liming materials have been thought of largely, if not exclusively, as a means for correcting acid soils. There is an increasing tendency to consider other features fully as important—perhaps more important than that of acid neutralization. Calcium especially and also magnesium, as plant foods, seem to rank well up toward the head of the list. Especially is this true in connection with legume crops—the various clovers, alfalfa, beans, peas, etc. The legumes are extremely heavy feeders upon the mineral plant foods, which they have an exceptional capacity for using directly in the inorganic form. In addition, the legumes have the invaluable faculty of gathering nitrogen from the air, in inorganic form, and storing it in their own structures in the organic form. Many of the grain crops on the other hand (corn notably) lack the ability to make such ready use of plant food in the inorganic form It follows, therefore, that it is a constructive and profitable practice to feed minerals to legumes and then by plowing under the latter to supply both minerals and

nitrogen in organic forms to corn and other grains.

There is much talk, at present, about the depressing effect upon agricultural welfare, in this country, of the surplus crop production above domestic requirements. It is not uncommon for writers and speakers, as well as individual farmers, to express the feeling that the efforts in the past to increase the productivity of our soils has been a boomerang. It seems to the writer that this is an erroneous conclusion and does not take into account all of the facts, or approach the matter from the correct angle. Soil fertility in this country should and must be maintained and improved—not so much as a matter of increased total agricultural production, as a matter of economic production per unit. Whether or not marketing problems and the problem of the so-called "exportable surplus" are solved, there will always be the problem of unit cost in production and this has a direct relation to productivity per acre and per man which, in turn, has a direct relation to soil fertility. With the adoption of legume acreage in crop rotations, grain acreage can be reduced; production per acre increased; unit costs lowered; soil fertility and intrinsic value of the farms maintained, and agriculture made that much more profitable and attractive. All this means increased use of liming materials and phosphates and an advanced knowledge in their use.

Changing Specifications for Limestone

With the changing thought as to the reasons for the use of limestone on the soil, there comes a corresponding change in emphasis in specifications, both chemical and physical. The question arises: What is the relative value of calcium and magnesium? Also, the question: How finely should the material be pulverized to secure the greatest economic return relative to the cost? At present, there is a rather wide range of opinion and practice, as to fineness, in various parts of the country. Doubtless there always will and should be a material variation. Soil types and crop types vary, as do, also, matters of rainfall and surface and sub-surface drainage. The finer the material physically, for any given type of stone, the more rapidly available will it be. Fine material, therefore, has an advantage where quick correction of acid conditions is the prime consideration. But if cost of repeated distribution on the fields and loss through leaching are material factors, a coarser, more enduring and slowly yielding grade of stone would seem to be indicated.

These are only samples of the factors which enter into the determination of the best specifications under a given set of conditions. As conditions vary, so will specifications. Heretofore, it has been unfortunate that there has not been opportunity for more direct co-operation between the group interested in abstract research, on the scientific agricultural side, and the group interested in quarry operations and concerned with factors entering into the industrial costs. Neither has understood sufficiently the problems and limitations of the other Every effort directed toward bringing the two groups together in better mutual understanding and co-ordination, is a step in the direction of efficiency and economy.

Another factor which is constantly changing, more or less, is that of available sources of supply. New operations spring up from time to time in the various districts and old operations become larger or smaller factors through changes in their production methods and changes in the market opportunity for their various other sizes of stone. As in the case of any other commodity, the production of which is at least in part a by-product or co-product with other sizes or grades of the same material, changes in the ratio of one size or grade to another may result in a more or less pronounced swing from oversupply to shortage of supply, and vice versa. Such conditions sometimes tempt the producer to swing up and down a bit radically in his price policies. Fluctuations in price, above and below what might be considered a reasonable level, fair to both producer and consumer, have a tendency, in the long run, to make for confusion, uncertainty and dissatisfaction in the mind of the user and to check development of demand accordingly. The writer believes that it is as much in the interest of the user of agricultural limestone as it is in the interest of the producer to maintain stability at what may be considered a proper and fair price level.

Competition—Price Differentials

Where two sources of supply produced under widely different conditions and costs comes into competition with each other; and neither is adequate (type, quality, quantity and distribution all considered) to monopolize the current and future demand; great care, patience and wisdom are required not only as a matter of fairness between the competing producers, but also as a matter of future safety to the cause of agriculture and the welfare of the farmer-user. An example of such a condition is found in the competition between a high calcium stone of the St. Louis territory and the dolomitic by-product from the lead mining industry of the Bonne Terre and Flat River districts in Missouri. Both of these stones are good and suitable for agricultural use. They are not alike and do not meet, equally well, specific needs. It is desirable that ultimately a suitable adjustment in price differential between the two stones, be brought about, which will permit the satisfactory continuance and development of both sources of supply and, yet, will encourage the farmer-user with an economically low delivered price.

Some of the producing quarry companies have adopted what is known as a seasonal differential in price. After determining a fair average level for the year, as a whole, a reduction from this level is offered during the season of the year when the demand is normally light and a corresponding premium secured during the high demand period. This would seem to be sound practice in the interest of both economy and service. Every ton which can be shipped in the off-season is one less ton to be stored and re-handled at the production end, and every such saving in cost at the production end can and should be reflected, in the long run, in the price the purchaser pays. The greater the proportion of a quarry operator's total tonnage which he can ship in the dull season, the easier it is for him to make prompt deliveries on his orders in the rush season. The purchaser who expects prompt service in the busy period should be willing to concede some benefit to the purchaser who is willing to experience the inconvenience of taking his shipment in the off season

An important factor in sales and distribution of agricultural limestone is the freight charge. In parts of the country, notably in Illinois, agricultural limestone enjoys a relatively low freight rate. The reason for this is not that the cost of transporting a car of limestone is so much less than is true for other commodities. It lies in the fact that the railroads at least partially realize the importance of their own interests of promoting soil fertility as the first step toward profitable agriculture and rural thrift along their rights-of-way. It is "bread on the waters" to encourage, by very low freight rates, the use of agricultural limestone, if by so doing the farmer is helped to a more prosperous condition and there is a consequent increase in high priced out-shipments of farm products followed by in-shipments of goods which the farmer is thus enabled to buy. In the past, higher railroad officials, responsible for the major policies of their companies, have been interviewed and sold on the soundness of this principle, and in the future the maintenance of favorable rates must depend upon the keeping of such higher officials "sold," and interested, rather than upon technical arguments, along purely transportational and freight rate lines with the general freight departments who are quite properly interested more exclusively in the matter of direct revenue.

Bad Weather Cuts Demand

Weather conditions during the summer and early fall of 1926 were exceptionally bad and proved to be a very great handicap to the use of limestone throughout the heaviest using territory. In Illinois the year started off with an early demand that gave promise of a new annual record—perhaps beating even that made by this state in 1925 of approximately 800,000 tons. But later in the summer, when normally the most limestone is used, the fields were kept saturated for a long period by repeated rains. With farm work behind season and a need for the farmer to seize every good day and every reasonably dry spell to "catch up," it is no

wonder that many orders which have been placed, were cancelled and other potential orders were never realized. In spite of these disadvantages, it seems probable, at the time of this writing, that the 1926 total for Illinois will somewhat exceed 500,000 tons. Other nearby states experiencing similar difficulties will, in all probability, show similar results relatively. It is hard to forecast what the holdover effect will be upon the demand in 1927. If the financial consideration did not enter into the problem, it would seem reasonable to expect the new year to be a great one, through a disposition to recuperate the lost tonnage, but the farmers' financial condition, already bad, has been made worse by the effect of the bad weather upon his current crops.

We have already touched upon the advantage of close co-operation and mutual understanding between the producing group and those representing the using farmer. Experience along this line has shown such relationship to be invaluable. Through it rough spots may be ironed out; misunderstandings may be avoided or cleared up; unnecessary factors, adding to the delivered cost, may be gradually eliminated and maximum results per dollar secured, with a fair division between producer and consumer. The state which the writer represents has been following this policy for several years and we are happy with and proud of the results.

Phosphate Problems

Ground rock phosphate, as a soil-building commodity, carries some very difficult industrial and commercial problems of its own. Illinois is much the largest user of natural rock phosphates, and even here the developed demand is for an inadequate tonnage upon which to spread the necessary overhead expenses of the industry, without materially affecting the price. As compared with conditions, say fifteen years ago, when the industry was relatively young, direct production costs have advanced heavily and unavoidably; mining is now much more expensive; the more easily available deposits have been quite largely mined out and the average present-day operation entails more or less expensive stripping of overburden. Common labor in the phosphate fields is from two to three times what it was earlier; fuel is much higher; and, finally, grinding costs have advanced, not only due to cost of machinery, power and labor, but also because specifications are much more rigid than formerly, with a consequent reduction of hourly tonnage per mill. Unfortunately there is, in addition, a heavy sales resistance to be met.

The proper use of ground rock phosphate has been repeatedly demonstrated to be a profitable one, but returns are not all immediate. It is a practice which, to quite an extent, builds for the future; and it is human nature for the farmer to prefer to spend his very limited amount of available cash for items which are more immediate in character and perhaps appeal more to personal gratification and enjoyment. In order, therefore, to develop, or even to maintain, a living tonnage for the industry, resort must be had to high pressure sales work, which, in turn, adds heavily to the cost and through it, again, to the sales resistance. Thus we have a difficult so-called "vicious circle."

What the future holds in store for this industry it is impossible to predict. It is greatly to be hoped that agriculture may be put upon a sufficiently profitable basis to make it reasonably easy for all farmers to adopt, and consistently to practice, soil building and restorative methods. Under such a condition there could not fail to be a very great possibility for ground rock phosphate, as there is for agricultural limestone. In the meantime the scientific research departments, experiment stations, etc., are discovering new truths and perfecting farm technique under which greater and earlier returns from this commodity may be secured; all of which is a great help in the right direction.

Summary of Conditions in the Grain States

The following is a brief survey, state by state, of the mid-west or grain belt.

OHIO recognizes three grades of limestone in its fertilizer law.

(1) "Agricultural ground limestone" defined as material 95% of which will pass 10 mesh; 50% will pass 50-mesh and 30% will pass 100 mesh.

(2) "Agricultural limestone meal" defined as material 100% passing 4-mesh; 80% passing 10-mesh; 30% passing 50-mesh; 20% passing 100-mesh.

(3) "Agricultural limestone screenings" which includes all material which will not measure up to the first two classes, but 100% of which will pass a 3-mesh. This last material is presumed to include everything finer which results in the reduction process.

The latest compiled figures for Ohio are for 1925, in which year it used 236,000 tons of liming material, most of this was "agricultural ground limestone." Between 4 and 5% of the total used was in the form of burnt and hydrated lime, and 14 to 15% was agricultural slag and other similar materials. Practically no ground rock phosphate was used. There is a great deal of acid phosphate used.

MICHIGAN—The tendency here, in liming materials, is toward limestone screenings. At present, the predominating grade will show about 85 to 95% through 10-mesh and 25 to 40% through 100-mesh. Some pulverized limestone is sold. The largest producer furnishing this material guarantees 60% through 100-mesh and 100% through 60-mesh. Only small amounts of hydrated lime and practically no ground rock phosphate are used. The trend in phosphate materials is toward acid phosphate.

INDIANA—Limestone used in this state is mostly 10-mesh and finer. Some ¼-in. screenings are used. The latest figures are for 1925, in which year approximately 200,000 tons of liming materials were used. About one-tenth to a one-eighth of this was marl and hydrated lime. The demand is steadily increasing. There is relatively little ground rock phosphate used and there is little tendency to increase its use. Considerable acid phosphate is used and some treble super-phosphate.

KENTUCKY—The latest figures are for 1925, where there were used about 125,000 tons of limestone; 1,200 tons of burnt lime and 10,000 tons of marl. Only a small amount of ground rock phosphate is used. Professor George Roberts, of the Kentucky university, thinks that, at least, one reason for so small amounts of ground rock phosphate being sold is that it is not a commodity which is, to any considerable extent, merchandised locally in less than carload quantities. The kind of limestone used in the past has been fairly coarse but the present tendency is toward finer material.

TENNESSEE—The writer has no authoritative report from Tennessee, but his own observations are that there is a wide distribution of suitable limestone deposits and a local production of agricultural limestone by means of small, portable plants. This applies primarily to middle Tennessee and, perhaps, to eastern Tennessee. The low-lying flat country of western Tennessee uses some liming material shipped in from commercial sources, some of which are outside of the state; for instance, from the St. Louis territory. Farmers in middle Tennessee consider that their lands are rich in natural phosphates and that phosphorus, therefore, is not a problem with them. To what extent this is born out by scientific facts, we are not informed.

WISCONSIN—About 100,000 tons of liming material has been used each of the last two or three years. Approximately one-half of this material is the product of local portable plants. About one-sixth comes from commercial sources. About one-tenth is marl secured locally. The balance consists largely of refuse from sugar beet factories, paper mills, etc. The authorities recommend an agricultural limestone, 50% of which will pass a 60-mesh sieve. The use of liming materials is said to be increasing rapidly. Very little ground rock phosphate is used, but some acid phosphate is being resorted to.

IOWA—The use of limestone has practically doubled each of the last three years. This year the amount used seems to be governed by the available supply. More interest is being shown, at present, in the project of legumes with the use of lime and phosphorus as a prerequisite, than in any other farm crop work. The last figures are for 1925, in which year about 50,000 tons of agricultural limestone were used, most of which consisted of quite coarse screenings,

as a by-product from limestone quarries. The tendency at present is to demand a somewhat finer material. Comparatively little phosphatic fertilizer is used and most of this is in the form of acid phosphate, although in some localities there is a tendency to adopt the use of ground rock phosphate.

MISSOURI—The latest figures available are for 1925, in which approximately 100,000 tons of lime were used—about one-half of this was ¼-in. screenings and the other half ⅛-in. pulverized material. Practically no ground rock phosphate has been used. The present tendency seems to be toward a greater use of both limestone and commercial fertilizers with considerable interest in high grade fertilizers.

KANSAS—Not much interest is shown in the agricultural limestone problem, excepting in the eastern third of the state where the use of limestone constitutes an important project in connection with the growing of legume crops. The supply of material is mostly the product of local portable plants, promoted by the county farm bureaus. Some 10-mesh material is being supplied in eastern Kansas frome limestone quarries and cement plants in that territory. In this territory at least one concern is producing a very fine material (85% through 200-mesh) for use as an asphalt filler. Some of this is being sold for agricultural purposes, although it is much finer and relatively more expensive than the farmer would prefer. Very limited amounts of acid phosphate and bone meal are used in southeastern Kansas and some ground rock phosphate is also being used. Where the ground rock phosphate has been used in rotations which include legumes, it is said to have shown up favorably with other forms of phosphate fertilizer.

NEBRASKA—So far, Nebraska has developed no interest in and perhaps no need for either liming materials or phosphate fertilizers.

Increase in Legume Acreage

Perhaps the best barometer by which to gage the interest throughout the various states in mineral fertilizers, such as lime and phosphorus, is found in the relative tendency to increase legume acreage. Figures, which have been compiled by Mr. Shurratt, of the Illinois Department of Agriculture, along this line, are very interesting, although unfortunately they do not include sweet clover. During the period 1919 to 1924 the percentage of increase in legume acreage (excluding sweet clover) in seven of the mid-west states, and in the order of results, are as follows:

Missouri	66.9 Per Cent
Illinois	47.9 "
Indiana	41.4 "
Ohio	33.7 "
Michigan	30.5 "
Iowa	29.7 "
Wisconsin	21.9 "

Perhaps the reason for Wisconsin's increase being smaller than the other states is found in the fact that its legume project was developed earlier than most of the others because of the needs of its large dairying industry, and that during the period following 1919 there was less need for further increase. As a matter of fact, for the year 1925, it has the largest legume acreage of any of the seven states shown. On the other hand, the reason for the large percentage of increase in Missouri perhaps is found in the fact that in 1919 its acreage, relative to most of the other states, was small. For 1925, Missouri has a total acreage slightly less than Illinois. It seems probable that if the sweet clover acreage were included, the relative standing of the states would be changed and the percentage of increase, for the period involved, in nearly all of them be much more marked. The sweet clover project in Illinois has been a very large one, so that it is not unlikely that were this acreage included all around, Illinois would stand at the head of the list in both percentage of increase and in present acreage.

Acknowledgments

Grateful recognition is given by the writer to authorities at the agricultural colleges in the various states who have supplied him with information for their own states respectively; among these are:

E. E. Barnes, of the Ohio College.
H. R. Kraybill, State Chemist and Seed Commissioner of Indiana.
M. O. Pence, of the Indiana College.
O. B. Price, formerly of the Michigan College and now with the New York Central Railroad.
E. Truog, of the Wisconsin College.
F. G. Churchill and J. L. Boatman, both of the Iowa College.
P. F. Schowengerdt, of the Missouri College.
Geo. Roberts, of the Kentucky College.
P. H. Stewart, of the Nebraska College.
M. C. Sewell, of the Kansas College.
F. C. Bauer, of the Illinois College.

Gypsum Deposits of Canada

GYPSUM is second only to coal as the most important mineral produced in the provinces of Nova Scotia and New Brunswick, where it has been mined for more than a century.

In New Brunswick the chief production has come from the occurrences at Hillsboro in Albert county. These deposits contain an exceptionally pure quality of gypsum, and the Hillsboro products, for this reason, are in high favor with the building trades not only in Canada but also in the United States. The gypsum mined here is manufactured into hard wall plaster, finishing plaster and dental plasters of different grades. These products are largely sold in Canada, but a certain quantity also goes to United States purchasers and a good market has been developed with Australia and New Zealand. Only about one-fourth of the gypsum quarried is exported in the crude form. Occasional shipments of anhydrite, a mineral closely allied to gypsum, are also made to the southern United States for use as a fertilizer. Many other occurrences of gypsum in New Brunswick are known, but the Hillsboro deposits remain the greatest producers.

In Nova Scotia occurrences of gypsum are widespread and are the largest of any at present known in Canada, contributing 75% of the total Canadian production. Nine million tons of gypsum have been quarried in this province since 1872, the greater part of which has been shipped mainly in the crude form to the United States. Production for the province in 1925 reached a new high level of 471,174 tons, and statistics now available for the first six months of 1926 indicate that this high output will be maintained. Wall plaster made from the Nova Scotia product is said to have finer texture, smoother working qualities and more uniform "set" than that made from the gypsum generally produced in the United States and is in great demand in that country for these reasons. The chief producing area is at Windsor, Hants county, where five or six companies are operating. The Wentworth and Walton deposits are the principal sources, shipments of crude gypsum from these properties during the summer reaching 300,000 and 75,000 tons respectively.

Next in importance are the deposits of Victoria county, Cape Breton island. The gypsum from these quarries is calcined by mills in the locality and manufactured into finishing, hard wall and dental plasters, and for these products a good market has already been developed in Canada and in the Antipodes.

Most of the deposits and mills referred to have the advantage of nearby rail and seaboard facilities, and with increased activity in the building trades and a consequently increased demand for fire-resisting materials the industry has continued to expand. The extent and quality of these gypsum deposits are such as to indicate that an adequate supply will be forthcoming from this region for many years and new developments may be confidently awaited.—*Natural Resources (Canada).*

Gypsum Plentiful in the Sudan

IN his report on the mineral resources of the Sudan, North Winthrop, United States consul for the district, says in *Commerce Reports*:

"Gypsum and alabaster exist in extensive quantities in the hills, from a point 40 miles north of Port Sudan to the Egyptian border along the Red Sea. The absence of fresh water is the greatest difficulty to be met in this district.

"Sandstone is plentiful in the hills extending southward from the Egyptian frontier across the Nubian Desert to the fourteenth parallel. This stone is not exported, as it is also plentiful in Egypt and Abyssinia, but it is used extensively in the country for building material."

Work of the Bureau of Standards in 1926*

Tests of Experimental Concrete Mine Stoppings under Static Loads and Explosive Forces. In order to obtain a basis for the design of mine stoppings to be used in mines of the public domain, the Bureau of Standards is cooperating with the Bureau of Mines in carrying out a series of tests to determine the strength of several types of concrete and reinforced concrete slabs under explosive forces and static pressures of the same intensity. An experimental chamber 8 ft. by 4 ft. by 4 ft. inside dimensions has been built with one end open in which the stoppings will be placed for test. Charges of black powder will be used for the explosive forces and air pressures for the static loads. From the performance of the several types of stoppings recommendations will be made for their construction, and their use in the mines of the public domain will be required by law.

Investigation and Recommendations for Stucco Construction. During the past 15 years the Bureau of Standards in cooperation with interested manufacturers and associations has been carrying out a series of investigations for the improvement of stucco construction. The results of all these investigations have been summarized and a recommended specification for portland cement stucco construction has been prepared and will be issued during the year as a Bureau circular under the title "Stucco Investigations at the Bureau of Standards with Recommendations for Portland Cement Stucco Construction."

Stevenson Creek, California, Experimental Concrete Arch Dam. The Bureau of Standards is cooperating with the Arch Dam Research Committee of the Engineering Foundation in obtaining the test data on the experimental arch dam constructed on Stevenson Creek, Fresno County, California. There are practically no physical data as to the action of the arch dams in existence, which accounts for much of the confusion on the subject of arch design. Lack of proper information upon which to base such designs is a serious impediment to this important type of construction, which is to be regretted because in many dam locations the use of the arch in place of the heavier gravity types offers the possibility of combining marked economy with greater safety. The experimental dam has been tested in order to obtain exact information under working conditions concerning the stresses, movements and changes of volume of thin arch dams so that design procedure may be brought into accord with conditions as found on a full-sized structure. The data obtained are being studied and being prepared for publication.

Studies of the Crazing of Portland Cement Mixtures. During the year some preliminary studies of crazing have been made on cement sand mortars. The results so far obtained indicate a fairly consistent relation between the tensile strength and the density of the mix. Further that the amount of crazing in most cases is inversely proportionate to the surface area of the aggregate per gram of cement content.

THE Director of the Bureau of Standards has permitted ROCK PRODUCTS to print that part of its Year Book which appears in these pages. This relates to the work of the Bureau on cement, lime and gypsum, with some added information of the work on concrete and building stone. We are certain that the excerpts given here will impress the readers of ROCK PRODUCTS with the great value to the industry of this research work, not only in its application to present problems but in the possibilities it holds out for expansion of the various branches of the rock products industry into new fields. Presumably every reader will want to possess the Year Book, which gives all that is given here and very much more in permanent form.—The Editors.

Proportioning and Grading of Aggregates for Concrete Strengths. With the increased cost of labor and materials it becomes more and more important to obtain given design strengths for concrete by proper proportioning and grading of the constituent materials. The Bureau of Standards is carrying out an extensive study of the effects of different cements, different types of aggregates, proportions of materials, gradation of coarse aggregates and the ratio of fine to coarse aggregate on the strength of concrete.

Hollow Tile and Concrete Floor Slabs. An investigation of the structural value of hollow tile when combined in slabs of hollow tile and reinforced concrete has been completed recently at the Bureau of Standards. The results of this work will be found in Technologic Paper No. 304 "Tests of Hollow Tile and Concrete Slabs Reinforced in One Direction."

Shear Tests of Reinforced Concrete Beams. During the World War the great demand for ships led to the construction of vessels of reinforced concrete. The use of concrete for such a purpose necessitated a new set of standards for design. Under the usual working stresses it was found necessary to make the wall from 12 to 15 in. thick. A series of tests was started to find a means of reducing the thickness, and the results showed that by the use of sufficient steel reinforcement properly placed in the walls of the ship it was safe to make the shell only 4 or 5 in. thick instead of 12 or 15.

The prospect that the information would be of great value in the construction of bridges and buildings as well as in ship work led to the extension of the tests to include many additional phases of the problem. This work has been completed and the bureau has now published the results as Technologic Paper No. 314 entitled "Shear Tests of Reinforced Concrete Beams."

Durability of Concrete in Alkali Soils. Members of the bureau's staff completed an inspection of the Western alkali field installation in the fall of 1923. A detailed description of the work and the conditions found at each site has been prepared. Further, the work previously accomplished has been summarized and while the conclusions already drawn up and presented in other papers by the bureau are not materially changed, a complete report has been published as it gives the results for a full ten-year exposure period for many of the installations. This paper was released during the year as Technologic Paper No. 307 entitled "Durability of Cement Drain Tile and Concrete in Alkali Soils; Fourth Progress Report."

Concrete Products. During the year considerable study has been made of the properties of concrete units. A circular has been prepared dealing with the essential factors concerning the manufacture and properties of concrete building units. This has been released as Bureau of Standards Circular No. 304 entitled "Properties and Manufacture of Concrete Building Units."

Physical Properties of the Commercial Limestones. Because of frequent calls for information on the properties of limestones now on the market a testing program has been undertaken by the bureau to supply the desired data. Samples have been collected as far as possible from all the important producing districts and the tests have been completed. The results of the work which include data on the compressive strength, transverse strength, shearing strength elasticity, absorption, porosity and unit weight are being prepared as a technologic paper under the title "Physical Properties of the Principal Commercial Limestones Used for Building Construction in the United States."

Cleaning Stone Work. In connection with the limestone research fellowship at the Bureau of Standards considerable time has been given to the study of cleaning masonry by means of the steam jet. Actual field cleanings have been carried out and encouraging results have been obtained. Since this process is economical, and does not injure

*Published by permission of the Director of the Bureau of Standards.

the stone it should be more generally employed. An article dealing with some of the results obtained by this method appears in the June 20, 1926 issue of the "American Architect."

Installation and Care of Interior Marbles. The bureau is cooperating with the National Association of Marble Dealers in a study of several problems in the installation and care of interior marbles. The problems are: The development of protective treatments against discoloration; study of methods for removing deep seated stains due to various causes; determination of the effect on marble, and the relative merit of, the several cleaning compounds; and the development of proper methods for cleaning marble.

Considerable progress has been made on the removal of stains and methods of cleaning, and a series of articles has appeared during the year in the marble dealer's trade journal, "Through the Ages," published by the Thomsen-Ellis Co., Baltimore, Md.

Colorless Waterproofing Materials. Exposure tests on specimens of sandstone and limestone, treated with various types of colorless waterproofing materials, are being conducted to determine the durability of the treatments. The waterproofing treatments under test include all the common types in general use. The tests involve a long exposure to the weather of treated samples of stone which are submitted to absorption measurements at intervals. Some of these tests which have been in progress for six years indicate that the paraffin treatments are the most durable and that this type of treatment does not deteriorate appreciably during this period. These tests are the continuation of the work described in Bureau of Standards Technologic Paper No. 248 entitled "Exposure Test on Colorless Waterproofing Materials" which paper was based on the results of exposure tests at the end of two years.

Constitution and Hardening of Cement. In addition to the studies of cement carried on in cooperation with the Portland Cement Association, cements composed largely of oxides of titanium or barium have been investigated. It was found that the former developed no particular hardening properties unless considerable amounts of alumina were present. The study of barium silicate and aluminates showed that both, and especially the latter, develop excellent hardening properties. However, neither was hydraulic, since the large amount of barium hydroxide which crystallized from the silicate ultimately resulted in disintegration, likewise the large amount of a reversible very sticky colloid, formed from the aluminate in the presence of water, resulted in expansion to such a degree that failure resulted when the hardened aluminate was placed in water. Some cements approaching the composition of portland cement but containing varying amounts of iron were also made, but the data obtained did not permit of making any positive conclusions.

Many of the quick hardening portland cements now on the market were tested and found to possess this quality in varying degrees. None showed any marked difference in composition from that of ordinary portland cement. Generally they are much finer ground, and while they show excellent strength in concrete at 72 hours none approach the strength in concrete of the high aluminate cements at 24 hr.

Considerable time was spent in studying the heat of reaction of portland cement in an adiabatic calorimeter. The automatic control for the calorimeter has not yet been worked out and this is essential as heat is evolved over a long period—60 hr. or more. However, the apparatus shows that different portland cements have different rates of reaction during the first 8 hr. and that the gypsum added to regulate the set retards the rate during this period.

The matter of the hardening of cement is such a complex problem that but little progress has been made in this study. The work was restricted largely to the aluminates, and while it was found that the hydrated tricalcium aluminate is one of the products of hydration there is also evidence that there is a tetracalcium aluminate and possibly also an aluminate of low lime-alumina ratio. The reaction of the aluminates with water containing chlorides and sulphates was also studied and one calcium chlor-aluminate and two or possibly more calcium sulpho-aluminates were noted.

Use of Lime in Chemical Industries. During the year one recommended specification for lime, namely, for use in the purification of water, prepared by the Interdepartmental Conference on Chemical Lime, was issued as Circular No. 231 of the bureau. Several other specifications have been prepared by the conference, which include those for lime for use in the tanning of leather, the manufacture of soap, and the distillation of ammonia. However, before publication of the last two specifications the bureau was requested to determine the insoluble matter in 1:9 hydrochloric acid in hydrated lime, and the fineness of slaked chemical quicklime. For these purposes representative samples of chemical hydrated lime and chemical quicklime have been obtained from the manufacturers.

Bond Between Mortar and Sand-Lime Brick. An investigation to determine the strength of the bond between mortar and sand-lime brick is now being conducted by the bureau. One phase of the problem necessarily consists of a study of the effect of various physical properties of the brick, such as total absorption, density (including pores), specific gravity of solids in the brick, and rate of drying, upon the adhesion of the mortar to the brick. Consequently these properties have been determined upon 1325 individual bricks, representing the product of eight manufacturers. Some very interesting relationships have been found to exist, including the following:

When sand-lime brick are immersed in water, those of the highest total absorption show the most rapid rate of absorbing water at the start, and they are the first to approach a condition of saturation; the limit of their capacity for absorbing water is nearly reached in 12 hr., and very little more water is absorbed if the immersion is continued for seven days. At the end of seven days' immersion sand-lime bricks contain on the average 4% less water than when boiled for 5 hr. The rates of absorbing water sometimes vary more between bricks of one make than between the average rates of bricks of two makes. The specific gravity of the solids in sand-lime bricks is so nearly the same that one can locate a smooth curve by plotting the points which represent the total absorptions and the density (including pores) of a number of bricks. Such a curve can be used in determining the total absorption of other sand-lime bricks without the use of water merely by determining the density of each. Bricks which are more porous dry out a little faster than those less porous and retain less water when air day, which amount varies from 0.5 to 1.0 % or more of water, depending upon the material of the brick and the relative humidity.

The data obtained were made the basis of a paper entitled "Some Physical Properties of Sand-Lime Brick," which was presented at the annual convention of the Sand-Lime Brick Association.

Some Properties of Gypsum-Lime Mixes. During the year the properties of gypsum-lime mixes, such as used in the finish coat in plastering, with reference to time of set, tensile and compressive strength, shrinkage and plasticity, have been determined, in which the composition was varied by 5% increments from 100% lime to 100% calcined gypsum (See "Some Properties of Gypsum—Lime Mixes," Rock Products, November 27, 1926.)

The results obtained indicate the following:

1. Quicklime and hydrated lime when added in small amounts to calcined gypsum accelerate the time of set. Maximum acceleration occurs when approximately 10% by weight of hydrated lime is present. When more than 50% hydrated lime is present retardation occurs which becomes marked at about 70% when the time of set approaches that of pure lime.

2. Hydrated lime in small amounts increases the tensile strength of calcined gypsum. A calcined gypsum-hydrated lime mix, rich in hydrate (in excess of 85%) has a greater tensile strength than a mix of like composition containing an equivalent amount of quicklime.

3. The addition of lime to calcined gypsum in all amounts lowers the compressive strength. The compressive strength of a gypsum-hydrate mix is greater than that of a gypsum-quicklime mix, where the lime content is equivalent.

4. A certain amount of lime may be added to calcined gypsum without affecting the shrinkage on setting, but above this definite amount the addition of lime increases shrinkage.

5. Lime in all proportions increases the plasticity of calcined gypsum.

How to Make Lime Set Quickly. During the year work has been continued on the burning of impure limestone for the production of a quick-setting lime plaster. A very thorough study of a few types of stone disclosed the fact that undoubtedly a quick setting plaster could be manufactured from impure limestone and the desirable limits of the impurities, namely, silica and alumina, were determined. It was found that approximately 10% silica was necessary and about 3% alumina. Furthermore, it was found that magnesia did not behave in the same manner as lime. The temperature of burning necessary is approximately that obtaining in the usual lime kiln, but more work is necessary to determine the optimum duration of burning. A minor amount of experimental work disclosed that the burned impure stone could be satisfactorily hydrated in one type of commercial hydrator provided accurate control of the hydrating water was possible. It is proposed to continue the work, employing a number of stones from different localities in order to evaluate properly the several factors involved in the production of the desired plaster. This work is supported by the National Lime Association.

Investigation of Plaster Failures. In order to compare intelligently magnesian and high calcium limes with respect to their hydration and the actual percentages of calcium and magnesium oxides combined either as carbonates or hydroxides a method of analysis differing from the usual chemical method is necessary. During the year a method which will determine the above properties has been developed and consists in brief as follows:

A sample of the material in question, either hydrated lime, mortar or similar material, is heated at succeeding temperatures for definite periods of time. The loss in weight is determined after each heating and from the data thus obtained a curve is plotted, temperature against loss in weight. Definite breaks occur in this curve, indicating the dissociation of the magnesium hydroxide, calcium hydroxide, and calcium carbonate, and from the curve the loss in weight due to the decomposition of each of these compounds may be readily calculated. It has not been found possible to identify magnesium carbonate by this method, since the temperature range in which it decomposes is too nearly the same as that for the calcium hydroxide. This, it is believed, does not affect the results as determined for the calcium hydroxide, at least so long as the calcium hydroxide exceeds the magnesium carbonate, as it almost universally does. The carbon dioxide set free by this decomposition is very probably absorbed by the calcium oxide, appearing later as calcium carbonate. This of course makes the results obtained for calcium carbonate in error by just this amount. The method does, however, give good results for calcium hydroxide and magnesium hydroxide, and it is probable that when relatively small percentages of carbon dioxide are present this constituent occurs almost entirely as calcium carbonate.

A considerable number of samples of commercial magnesian hydrated limes have been investigated by this method. It was found, in general, that samples freshly made contained very little magnesium hydroxide, but that the calcium oxide content was practically completely combined. This may in part be due to the actual slowness of the hydration of the magnesia and also to the practice commonly followed in hydrating quicklime, of adding only enough water to satisfy the chemical requirements of the calcium oxide.

Weatherproofing of Gypsum. In attacking the problem of weatherproofing gypsum for outdoor uses three general methods presented themselves: First, covering the set material with some waterproof coating in order to keep the moisture from the gypsum; second, precipitating on the surface an in soluble compound formed by a reaction of some material with the gypsum, and third, by the addition of an integral waterproofing compound to the gypsum, which when the gypsum has set acts as a water repellent. Among the more recent compounds used which indicate the possibility of being successful as a weatherproofing material blood albumin is by far the most promising. Cylinders of neat gypsum, to which a small amount of blood albumin glue was added to the mixing water, are resisting the weather unusually well. The cylinders that were treated with barium hydroxide also show satisfactory resistance.

Rate of Drying of Wall Plaster. It is the general opinion that in the decoration of plasters the plaster should be dry, or almost so, for a satisfactory job. The question then arises as to when is a plaster dry. It is considered to be dry under the existing conditions when the humidity of the air in pores of the plaster is the same as the humidity of the air surrounding the plaster.

To date the rate of drying gypsum, lime, and cement plasters of the usual compositions in both sand-float and white-coat finishes with ½-in. and ⅞-in. grounds has been determined at a temperature of 98 deg. F., exposed to both dry and humid air at a velocity of 80 cu. in. per minute. The results of these tests indicate that of the three plasters, lime dries the slowest and gypsum the fastest, with cement intermediate, when the conditions are the same. However, the difference in time necessary for the drying of gypsum and cement plasters is almost negligible. With ⅞-in. grounds the difference in time necessary for drying in the case of the slowest and the fastest is only about 30 hours. The results also show that the time necessary for drying in the case of all of the plasters increases with the humidity. While four days were required for gypsum plaster of ⅞-in. grounds to become sufficiently dry to be satisfactorily decorated when exposed to dry air, five days were required for the same plaster when exposed to humid air. The other plasters showed a corresponding increase in the time necessary for dryness when exposed to humid air.

Determinations have also been made of the rate of drying of the same type of plasters at 86 deg. F., employing humid air at a velocity of 80 cu. in. per minute. Measurements are now being made at the same temperature exposed to dry air with the aforementioned velocity.

Determinations were made during the past winter of the rate of drying of the same type plasters at 72 deg. F., using humid air at a velocity of 80 cu. in. per minute. Under these conditions the rate of drying of plasters is very slow indeed, some requiring six weeks to dry completely. Next winter the same type plasters will be dried at the same temperature and air velocity, but exposed to dry air.

Ready-Sanded Gypsum Plaster. An investigation which has for its purpose the development of improved formulas for gypsum-sanded mixes with especial reference to ready-sanded gypsum plasters is being conducted. Taking a representative commercial unretarded gypsum gaging plaster and adding to it different percentages of clay, hydrated lime, ground asbestos, and talc, determinations have been made of their effect in a 1:2 and 1:3 gypsum-sanded plaster. Tests were also made to determine the effect of different percentages and gradings of sand on the physical properties and working qualities of gypsum-sanded plasters. The following physical properties were tested in all cases: Tensile strength, compressive strength, dry volume, wet volume, water to bring the mix to testing consistency, and the working quality of the mortar.

In the tests of gypsum plasters to determine the effect of different percentages of sand, ratios of 1:1 to 1:5 gypsum-Potomac River sand were used. The results showed that the addition of sand decreased the tensile and compressive strengths and also the working quality.

Tests were next made to determine the effects that different percentages of certain materials usually employed to improve the working qualities of plaster have on the physical properties of a 1:2 and 1:3 gypsum-Ottawa sanded plaster. According to the American Society for Testing Materials' Standard Specification for Gypsum-Sanded Plasters 75% of the material added to the sand must consist of calcined gypsum and the other 25% may consist of materials to control the working qualities, time of set, etc. It was decided, therefore, to replace 5%, 15% and 25% of the calcined gypsum

in a 1:2 and 1:3 sanded mix by each of the above materials. It was found that each of the above materials had different effects on the working qualities of the sanded mixes; the talc and hydrated lime caused the mix to work better, but only for a short time. The clays and asbestos increased the time of workability of the plaster mixes. They all, with but one or two exceptions, decrease the tensile and compressive strengths, require more water to bring the mix to testing consistency and improve the working qualities of the sanded mixes. The effect of replacing, 5%, 15% and 25% of the calcined gypsum by two of the above materials has also been studied.

Bibliography of Gypsum. Although much has been written about the occurrence, composition, manufacture, technology and uses of gypsum, the information has been so scattered that to obtain any data at all from the literature required much time and trouble. A bibliography on the subject was found to be almost imperative. Therefore work was started to compile a card index of all the subjects published on gypsum. Several thousand articles have been listed and the bibliography will be completed this year.

Specifications — Lime and Gypsum Products. The following specifications prepared by the Bureau were promulgated by the Federal Specifications Board:

Federal Specifications Board Specification No. 248, U. S. Government master specifications for calcined gypsum (B. S. Circular No. 206).

Federal Specifications Board Specification No. 284, U. S. Government master specifications for gypsum wall board (B. S. Circular No. 211).

Federal Specifications Board Specification No. 285, U. S. Government master specifications for gypsum plaster (B. S. Circular No. 210).

Composition of Chemical Limes

AT the request of the Interdepartmental Conference on Chemical Limes, complete analyses of 37 chemical limes, 19 hydrates and 18 quicklimes have been undertaken. The purpose of these analyses is to obtain data to be used in the preparation of quality specifications for lime for various chemical uses.

The samples employed are representative of chemical limes and were manufactured in 13 widely separated states.

To date about one-half of the analyses are completed and from the results it is of interest to note the high purity of these limes that have undergone no especial treatment in manufacture, with the exception—if it may be classed as such—of the careful selection of crude rock and control in burning. The analyses include the determination of the following constituents: SiO_2, Fe_2O_3, Al_2O_3, CaO, MgO, P_2O_5, Mn_3O_4, As_2O_3, SO_3, CO_2, loss on ignition, matter insoluble in 1:9 HCl, and "available lime" by the modified Scaife method. Wherever practical the methods of the American Society for Testing Materials are used, otherwise the procedure employed is that developed by the chemical laboratory of the bureau.

The variation in composition of the samples thus far analyzed is indicated by the following tabulation:

	Maximum Per cent	Minimum Per cent
Silica (SiO_2)	2.80	0.11
Iron (Fe_2O_3)	.19	.022
Alumina (Al_2O_3)	.97	.088
Lime (CaO)	74.26	49.58
Magnesia (MgO)	32.05	.20
Sulphur trioxide (SO_3)	1.00	.04
Carbon dioxide (CO_2)	1.96	.31
Loss on ignition	25.76	18.40

Phosphorus pentoxide (P_2O_5): As high as 0.10%, but generally only traces.

Mangano-manganic oxide (Mn_3O_4): Only traces with the exception of one sample which was 0.03%.

Arsenic trioxide (As_2O_3): Two to 10 micromilligrams per 1-gm. sample in two or three samples. In the rest, As_2O_3 was not detected. (Gutzheit test used.)

The averages of the analyses approach the minimum values shown above with the exception of lime (CaO), which approaches the maximum value. Two samples labeled "High MgO" and "High $MgO(OH)_2$" gave high results for the magnesia (MgO) value. The carbon dioxide (CO_2) content must not be taken too seriously, as it is probable that an appreciable amount of this constituent was absorbed by the limes incidental to the exposure necessary in the preparation of the samples.—*Technical News Bulletin* of the U. S. Bureau of Standards.

Workability of Concrete

IN the study of the workability of concrete a new method has been devised and a preliminary series of tests completed. The new apparatus is constructed as follows: A flexible mold 6 in. high and 8 in. in diameter was made of a sheet of phosphor bronze 1/16 in. in thickness. The bottom edge of the cylinder was ground to a plane and placed on a section of plate glass. The top of the cylinder was fitted with four small rollers so that a weighted frame could be placed on them to hold the cylinder down on the glass plate. Two 2x4-in. oak bars were placed on rollers and parallel to each other on the outside of the cylinder. These bars were attached by means of a system of pulleys and cords to a load pan. A small batch of concrete is mixed and placed in the cylinder to the depth of 5 in. A weight is placed in the load pan and the cylinder of concrete squeezed between the two bars. The reduction of the diameter of the cylinder is taken as a measure of the workability of the concrete. This reduction is greater the more workable the concrete.

In the field it has been observed that when enough water is added to a concrete mix to give a ½- to 1-in. slump it is dry and very difficult to shovel. A small increase in the quantity of water will increase greatly the ease of shoveling. The curves obtained by tests using Potomac River sand and gravel graded to ¾ in. with the new apparatus indicate this marked change. They also indicate that up to a certain point additional water increases the workability to a marked degree, but after this point is passed relatively large additions of water to the concrete have very little effect upon the workability until enough water is added to cause the materials to segregate.

It is planned to continue the investigation with an improved type of apparatus that is at present in the design stage.—*Technical News Bulletin* of the U. S. Bureau of Standards.

Safe Storage of Explosives

THE method of construction of magazines for explosives and the situation of magazines in relation to other structures, roads, or workings, is governed by law in many states, says the Bureau of Mines in Technical Paper 400, recently published. Where there is a choice of location, storage magazines should be built at such a place that the explosive need be handled but a minimum number of times in order to bring it to the mine entrance.

As the explosives usually deteriorate with age, wherever it is practicable not more than a 30 days' supply of explosives should be contained in a storage magazine at any one time. Fresh supplies of explosives should be so placed in magazine that the old stock may be used first. All of any particular class and grade of explosive on hand in a magazine when the supply is replenished should be used before any of that in the new lots. Cases of any dynamite other than gelatins should be so piled that the cartridges lie horizontally, in order to lessen the possibility of leakage of nitroglycerine from the explosives. Gelatin dynamite may be piled in any position.

Only low-freezing explosives should be used in cold weather. No frozen explosives should be sent underground or used in any circumstances. Bureau of Mines Technical Paper 18, "Magazines and Thaw Houses for Explosives," gives recommendations on the construction of thaw houses and on thawing frozen explosives. Copies of Technical Paper 18 and Technical Paper 400 may be obtained from the Bureau of Mines, Department of Commerce, Washington, D. C.

Primer of Simplified Practice

THE Bureau of Standards, Department of Commerce, has recently issued a bulletin with the above title in which efforts have been made to provide answers for the many questions received by the division of simplified practice. These questions, although of various types of interest, have been classified and typical answers given. An excellent bibliography of simplification, indexed under group classification, is included in the bulletin, which may be obtained from the Government Printing Office, Washington, D. C., at a price of 15 cents per copy.

Hints and Helps for Superintendents

A Simple Dust Collector

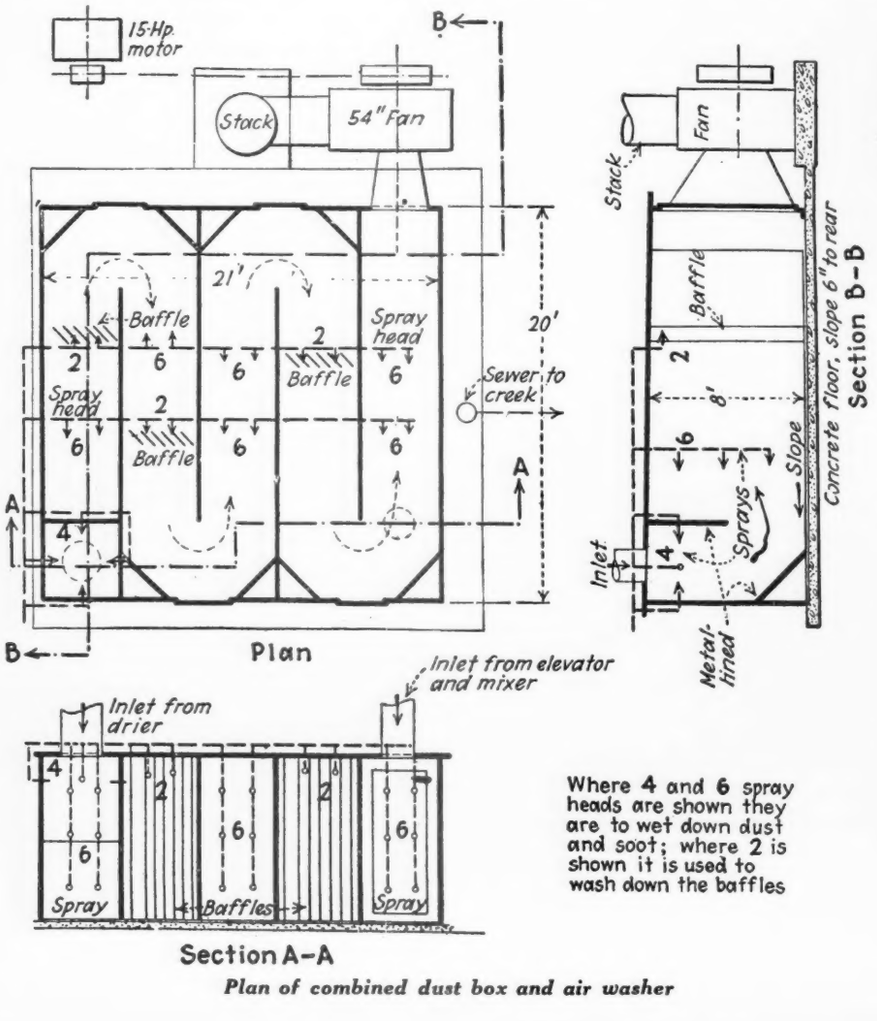
THE dust collector which is shown in plan and sections in the accompanying line cut was installed in an asphalt plant to catch the dust caused by drying paving materials. But it could be applied to any kind of plant in which it was not necessary to recover the dust in a dry condition. The illustration and description are from the Oct. 28 issue of the *Engineering News-Record*.

This dust box and air washer combined is made of 1¾-in. dressed and matched lumber entirely covered with roofing felt. It is 23½ ft. square and 8½ ft. high. Partitions in the interior form a continuous passage about 4 ft. wide and 100 ft. in length from inlet to outlet. In the first, third and last passages are spray nozzles and back of these are baffles to help collect and deflect the moisture and dust, other spray nozzles being placed so as to wash the baffles. At the outlet is a fan connected to a 30-in. steel stack 80 ft. high. Water for the sprays amounting to 300 g.p.m. was furnished by a centrifugal pump. It requires about 6½ gal. to wash down a pound of dust.

A photograph shown in the original article is evidence of the efficiency of the device as a dust catcher, as the air about the plant appears to be quite clear. A cyclone dust collector which was used previously proved inefficient in handling the very fine material that was easily caught in the dust box and air washer.

The material which settled in the bottom of the box was practically pure silica as almost all the clay was run off in the waste water. The silica was shoveled out and used as filler in the top mix.

The design of this device is credited to Harry C. McClure, city engineer of Flint, Mich.



Plan of combined dust box and air washer

Neat Tripod for Supporting Cable

WHERE current has to be brought to an electrically powered shovel or dragline, the supports for the cables must be of a temporary nature or so that they can be readily moved to a new position. One often sees very rough and insecure posts used to construct such a line. The use of such poor supports is dangerous and hard on the cable.

The cut shows a neat tripod used by the France Stone Co. at its quarries which fulfills all the conditions required for a support for cables. It is stable so that it cannot be pulled over easily and it is durable and

Movable tripod supports electric cable

at the same time it may be readily moved from one place to another.

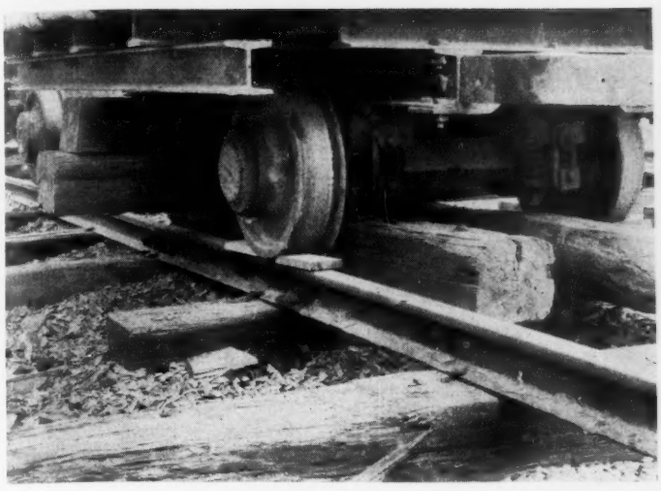
As the cut shows, it is made of ordinary 2½-in. pipe and standard pipe fittings. The single leg is screwed into a tee and two nipples in the same tee terminate in ells in which the other legs are screwed. If angle ells of 15 deg. or 22½ deg. are used, the legs may be spread at the bottom.

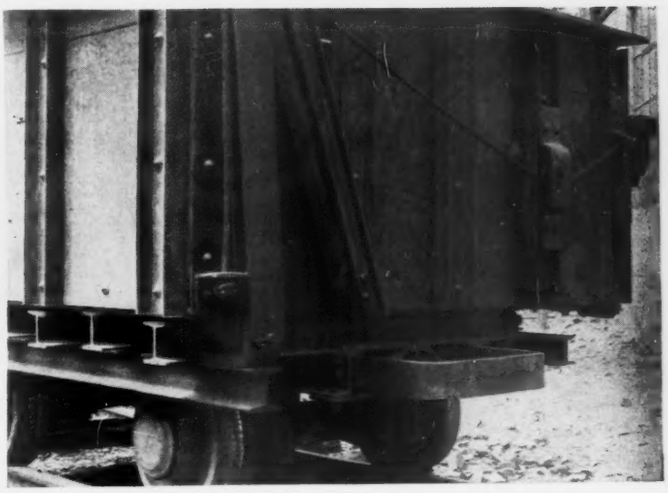
Quarry Car Construction

THE Lynn Sand and Stone Co., Swampscott, Mass., of which J. H. Cooke is president and W. D. Manchester superintendent, use quarry cars of their own design and construction. These cars are ruggedly built and have roller bearings on the wheels and spiral spring supports for the car bodies.

The axle construction, displaying seats for the four spiral springs, are shown in the smallest of the four views. The car bodies are made of structural-steel shapes, riveted, with plate-steel sides.

They are one-way side-dump cars, with a mechanism which causes the side opened to become level with the car floor, when the



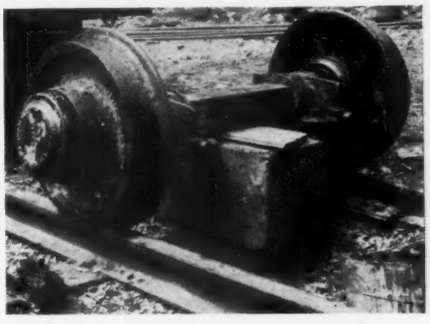


Left—Spiral spring supports on which the car body rests Right—View of car body showing the riveted structural steel construction and plate steel sides

car is dumping, preventing spillage of the rock between the car and the crusher opening.

This mechanism is plainly illustrated in one of the views. The door is hinged at the bottom with one long pin. To the top on each end is fastened a wire rope, which passes over one and under the other of two fixed pulleys attached to ribs on the car end. The rope then passes over a pulley at the top of a movable, hinged bar or arm on the opposite side of the car. The end of the rope is fastened to an angle iron on the car body below this pulley. The pivot of the movable bar or arm is fastened in the truck below the body. The end of the rope is in the car body and moves with the car body.

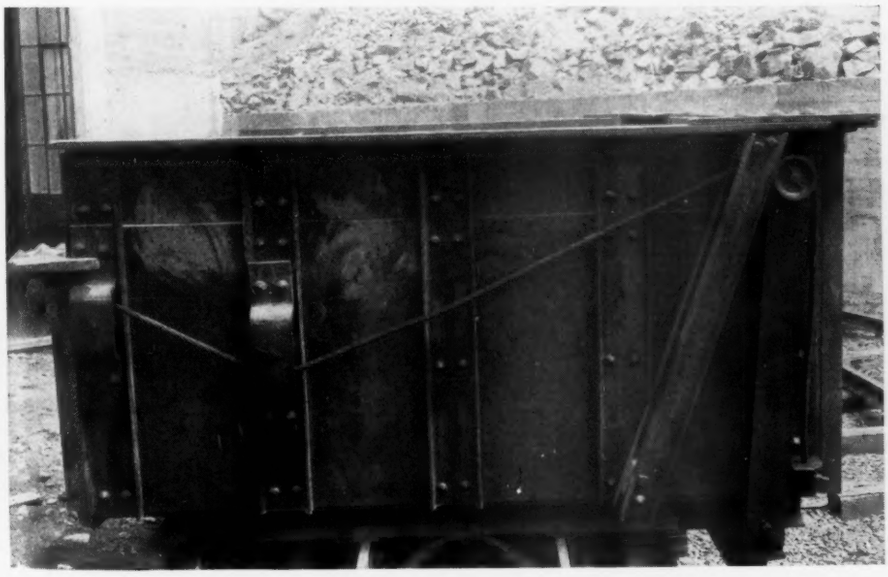
When the closed side of the car is raised the lever or bar with the pulley attached is pulled to the left (fourth view) and follows the inclined strut as the body rises. The axis about which the car body rotates is practically under the side of the car, which opens, so that in rising the pulley on the movable arm comes down and the fixed pulley on the car end moves up, relative to the straight line connecting the fixed ends of the wire rope.



Axle construction showing seats for spiral springs

This movement straightens out the wire rope, gradually, and the whole amount of slack line is just sufficient to allow the open car door to straighten out parallel with the car floor.

The device used to dump these cars was described in a previous "Hints and Helps" article published in the October 30 1926 issue of Rock Products.



Rear of car showing mechanism for opening the side

Ten Commandments for Foremen

An Editorial in the New York Commercial

FROM a large factory in San Francisco comes what is called the "Ten Commandments for Foremen." Needless to say, if every foreman strictly obeyed these commands at all times, the present excessive cost of labor turnover would be largely eliminated. The "Commandments" follow:

1. Be fair. Have no favorites and no scapegoats. A foreman has to act as judge many times every day; therefore, he must be just.

2. Make few promises and keep them. A foreman must be exact in this particular. Sometimes a foreman forgets that his job requires a high standard of truth and honor.

3. Don't waste anger—use it. Anger is valuable and should not be used carelessly. Keep your most forceful language for special occasions.

4. Always hear the other side. Never blame a worker until he has been given a chance to give his point of view.

5. Don't hold spite. When you have had to scold a worker, go to him later and show him his faults in a friendly way.

6. Never show disappointment. Never let yourself be beaten. A foreman must have perseverance and the "never-say-die" spirit.

7. Notice good work as well as bad. Let the workers see you can appreciate as well as condemn.

8. Watch for special ability. Take a keen human interest in your workers. Put each one where he can do his best.

9. Take your full share of the blame. This is the most difficult of all. The foreman who can share both blame and praise with his workers has discovered the secret of managing them.

10. Prevent accidents. Educate or eliminate the careless men. The good foreman is known by his men.

Financial News and Comment

RECENT QUOTATIONS ON SECURITIES IN ROCK PRODUCTS CORPORATIONS

(These are the most recent quotations available at this printing. Revisions, corrections and supplemental information will be welcomed by the editor.)

Stock	Date	Par	Price bid	Price asked	Dividend rate
Alpha Portland Cement Co. (common)[2] new stock	Jan. 3	No par	38	40	1½% quar. Apr. 3
Alpha Portland Cement Co. (preferred)[2]	Jan. 3	100	115	.....	1¾% quar. Mar. 1
Arundel Corporation (sand and gravel—new stock)	Jan. 5	No par	31½	32	45c qu., 20c ex. Jan. 3
Atlantic Gypsum Products Corp. (1st 6's carrying 10 sh. com.)[10]	Jan. 5	.....	110	.....	
Atlas Portland Cement Co. (common)[2]	Jan. 3	No par	40	42	50c qu. Dec. 1, $1 ex. Jan. 12
Atlas Portland Cement Co. (preferred)	.....	100	.....	.....	2% quar. Oct. 1
Atlas Portland Cement Co. (preferred)[2]	Jan. 3	33⅓	42	43	2% quar. Oct. 1
Beaver Portland Cement Co. (1st Mort. 7's)[3]	July 29	100	100	100	
Bessemer Limestone and Cement Co. (common)[4]	Dec. 17	100	135	.....	1½% qu.; $4 ex. Dec. 31
Bessemer Limestone and Cement Co. (preferred)[4]	Dec. 17	100	108	110	1¾% quar. Dec. 31
Bessemer Limestone and Cement Co. (convertible 8% notes)[4]	Dec. 17	100	99	100	8% annual
Boston Sand and Gravel Co. (common)[16]	Jan. 4	100	90	.....	1% qu., 2% ex. Jan. 1
Boston Sand and Gravel Co. (preferred)[10]	Jan. 4	.....	90	95	1¾% quar. Jan. 1
Boston Sand and Gravel Co. (1st preferred)[10]	Jan. 4	.....	90	95	2% quar. Jan. 1
Canada Cement Co., Ltd. (common)	Jan. 4	100	132⅛	132¼	2% Jan. 4
Canada Cement Co., Ltd. (preferred)[11]	Jan. 3	100	117	118	1¾% quar. Jan. 4
Canada Cement Co., Ltd. (1st 6's, 1929)[11]	Jan. 3	.....	101½	102½	5% semi-annual A&O
Canada Crushed Stone Corp., Ltd. (6½s, 1944)[11]	Jan. 3	100	93	96	
Charles Warner Co. (lime, crushed stone, sand and gravel)	Jan. 3	No par	22¼	.....	75c Jan. 12
Charles Warner Co. (preferred)	Jan. 3	100	100	103	1¾% quar. Jan. 27
Charles Warner Co. (lime, crushed stone, sand and gravel) 7s, 1929[16]	Dec. 31	100	102½	103½	
Cleveland Stone Co. (new stock)	Jan. 3	.....	48	48½	50c qu.; 25c ex. Dec. 15
Connecticut Quarries Co. (1st Mortgage 7% bonds)[17]	Dec. 30	100	104	.....	
Consolidated Cement Corp. (1st Mort., 6½s, series A)[24]	Jan. 5	100	95	99	
Consolidated Cement Corp. (5 yr. 6½% gold notes)[24]	Jan. 5	100	95	100	
Consumers Rock and Gravel Co. (1st Mort. 7s)[18]	Dec. 30	100	99½	101½	
Dewey Portland Cement Co. (1st mort. 6's 1942)[30]	Jan. 5	100	99	100	
Dolese and Shepard Co. (crushed stone)[7]	Jan. 5	50	91	93	$1.50 Jan. 1, $1.50 ex. Jan. 1
Egyptian Portland Cement Co. (7% pfd. with com. stock purchase warrants)[21]	Dec. 31	.....	95	100	1¾% quar. Oct. 1
Egyptian Portland Cement Co. (common)[21]	Dec. 31	.....	8½	10	40c quar. Oct. 1
Giant Portland Cement Co. (common)[2]	Jan. 5	50	81¾	82¼	
Giant Portland Cement Co. (preferred)[25]	Jan. 3	50	43	47	3½% and 19% ex. Dec. 15
Ideal Cement Co. (common)	Jan. 5	No par	70	72	$1 quar., $1 ex. Dec. 15
Ideal Cement Co (preferred)[6]	Dec. 18	100	105	108	1¾% quar. Dec. 15
International Cement Corporation (common)	Jan. 5	No par	51⅛	51¼	$1 quar. Dec. 31
International Cement Corporation (preferred)[2]	Jan. 3	100	104	104	1¾% quar. Dec. 31
Kelley Island Lime and Transport Co.	Jan. 3	100	131	133	$2 quar., $2 ex. Jan. 2
Lawrence Portland Cement Co.[2]	Jan. 3	100	80	90	2% quar.
Lehigh Portland Cement Co.[6]	Jan. 3	50	92	95	1½% quar.
Lyman Richey Sand and Gravel Co. (1st Mort. 6s, 1927 to 1931)[13]	Dec. 18	100	98	100	
Lyman Richey Sand and Gravel Co. (1st Mort. 6s, 1931 to 1935)[13]	Dec. 18	100	97	98½	
Marblehead Lime Co. (1st Mort. 7's)[16]	Dec. 31	100	100	.....	
Marblehead Lime Co. (5½% notes)[14]	Dec. 31	100	98	100	
Michigan Limestone and Chemical Co. (common)[6]	Jan. 3	.....	26	.....	
Michigan Limestone and Chemical Co. (preferred)[6]	Jan. 3	.....	24	26	1¾% quar. July 15
Missouri Portland Cement Co.	Jan. 3	25	55	56	50c Dec. 15
Monolith Portland Cement Co. (common)[9]	Dec. 30	.....	12	12½	
Monolith Portland Cement Co. (units)[9]	Dec. 30	.....	33	34½	
Monolith Portland Cement Co. (preferred)[9]	Dec. 30	.....	9	9½	
Nazareth Cement Co.[26]	Jan. 3	No par	37¼	39¼	75c quar. Apr. 1
Newaygo Portland Cement Co.[1]	Jan. 3	.....	115	.....	
New England Lime Co. (Series A, preferred)[14]	Dec. 30	100	.....	95	
New England Lime Co. (Series B, preferred)[23]	Jan. 3	100	94	.....	
New England Lime Co. (V.T.C.)[22]	Jan. 3	.....	35	38	
New England Lime Co. (6s, 1935)[14]	Dec. 31	100	99	101	
North American Cement Corp. 6½s 1940 (with warrants)	Jan. 5	100	94	95	
North American Cement Corp. (units of 1 sh. pfd. plus ½ sh. common)[19]	Aug. 14	.....	94	99	2 mo. period at rate of 7%
North American Cement Corp. (common)[19]	Nov. 8	.....	20	22	
North American Cement Corp. (preferred)	Dec. 31	.....	.....	.....	1.75 quar. Nov. 1
North Shore Material Co. (1st Mort. 6's)[15]	Jan. 5	100	98	100	
Pacific Portland Cement Co., Consolidated[5]	Dec. 30	100	.....	60¼	25c mo.
Pacific Portland Cement Co., Consolidated (secured serial gold notes)[5]	Dec. 30	100	96½	.....	3% semi-annual Oct. 15
Peerless Portland Cement Co.[1]	Jan. 3	10	5½	6	
Pennsylvania-Dixie Cement Corp. (1st Mort. 6's)[29]	Jan. 5	100	99½	100	
Pennsylvania-Dixie Cement Corp. (preferred)[28]	Jan. 5	100	99½	99½	1¾% Dec. 15
Pennsylvania-Dixie Cement Corp. (common)[28]	Jan. 5	.....	38¼	38½	80c Jan. 1
Petoskey Portland Cement Co.[1]	Jan. 5	10	9½	10	1½% quar.
Pittsfield Lime and Stone Co. (2 sh. pfd. and 1 com.)[10]	Jan. 4	.....	.....	225	
Rockland and Rockport Lime Corp. (1st preferred)[10]	Jan. 4	100	105	105	3½% semi-annual Aug. 2
Rockland and Rockport Lime Corp. (2nd preferred)[10]	Jan. 4	100	60	.....	3% semi-annual Aug. 2
Rockland and Rockport Lime Corp. (common)[10]	Jan. 4	No par	50	55	1½% quar. Nov. 2
Sandusky Cement Co. (common)[1]	Jan. 3	100	119	125	$2 qu., $4 ex. Jan. 1
Santa Cruz Portland Cement Co. (bonds)[5]	Dec. 30	.....	.....	105¾	6% annual
Santa Cruz Portland Cement Co. (common)[5]	Dec. 30	.....	.....	80	$1 quar., $1 ex. Jan. 1
Schumacher Wallboard Corp. (common)	Dec. 17	.....	21	22	
Schumacher Wallboard Corp. (preferred)	Dec. 17	.....	.....	26	
Superior Portland Cement, Inc. (Class A)[20]	Dec. 31	.....	45	46	
Superior Portland Cement, Inc. (Class B)[20]	Dec. 31	.....	22	23	
United Fuel and Supply Co. (sand and gravel) 1st Mort. 6s[27]	Dec. 31	100	98	100	
United Fuel and Supply Co. (sand and gravel) 6% gold notes[27]	Dec. 31	100	98	100	
United States Gypsum Co. (common)	Jan. 5	20	107½	109	2% quar., $1.40 and 35% stk. ex. Dec. 31
United States Gypsum Co. (preferred)	Jan. 5	100	115¼	.....	1¾% quar. Dec. 31
Universal Gypsum Co. (common)[3]	Jan. 5	No par	5	5½	
Universal Gypsum V.T.C.[3]	Jan. 5	No par	4½	5	
Universal Gypsum Co. (preferred)[3]	Nov. 23	.....	73	77	1¾% quar. Sept. 15
Universal Gypsum and Lime Co. (1st 6's, 1946)[3]	Jan. 5	100	.....	96	
Union Rock Co. (7% serial gold bonds)[18]	Dec. 30	100	99	101	
Wisconsin Lime and Cement Co. (1st Mort. 6s, 1940)[15]	Jan. 5	100	98	100	
Wolverine Portland Cement Co.	Jan. 5	10	5½	6½	3% Nov. 15

[1]Quotations by Watling, Lerchen & Co., Detroit, Mich. [2]Quotations by Bristol & Willett, New York. [3]Quotations by True, Webber & Co., Chicago. [4]Quotations by Butler, Beading & Co., Youngstown, Ohio. [5]Quotations by Freeman, Smith & Camp Co., San Francisco, Calif. [6]Quotations by Frederic H. Hatch & Co., New York. [7]Quotations by F. M. Zeiler & Co., Chicago, Ill. [8]Quotations by Ralph Schneeloch Co., Portland, Ore. [9]Quotations by A. E. White Co., San Francisco, Calif. [10]Quotations by Lee, Higginson & Co., Boston and Chicago. [11]Nesbitt, Thomson & Co., Montreal, Canada. [12]E. B. Merritt & Co., Inc., Bridgeport, Conn. [13]Peters Trust Co., Omaha, Neb. [14]Second Ward Securities Co., Milwaukee, Wis. [15]Central Trust Co. of Illinois, Chicago. [16]J. S. Wilson Jr. Co., Baltimore, Md. [17]Chas. W. Scranton & Co., New Haven, Conn. [18]Dean, Witter & Co., Los Angeles, Calif. [19]Hemphill, Noyes & Co., New York. [20]Quotations by Bond & Goodwin & Tucker, Inc., San Francisco. [21]Baker, Simonds & Co., Inc., New York. [22]William C. Simons, Inc., Springfield, Mass. [23]Blair & Co., New York and Chicago. [24]A. B. Leach and Co., Inc., Chicago. [25]A. C. Richards & Co., Philadelphia, Penn. [26]Hincks Bros. & Co., Bridgeport, Conn. [27]J. G. White and Co., New York. [28]Mitchell-Hutchins Co., Chicago, Ill. [29]National City Co., Chicago, Ill. [30]Chicago Trust Co., Chicago.

QUOTATIONS ON INACTIVE ROCK PRODUCTS CORPORATION SECURITIES ON PAGE 66

Editorial Comment

A Criticism of Concrete

Prof. George F. Swain of Harvard University, speaking before the Boston Society of Civil Engineers, criticized concrete and told his hearers why he preferred steel as a structural material. His criticisms boil down to: That concrete materials are variable; that they are mixed on the job, often by unskilled labor; that the material is not finished until it is in the structure and then it cannot be tested or rejected; that the volume changes with water absorbtion and that we do not understand the phenomena of the setting and hardening of concrete.

It would be easy and obvious to answer Prof. Swain by pointing out that thousands of the most important structures attest the permanence and economy of concrete, but his criticisms are worth more than this as every criticism is based on facts. Concrete *is* made from aggregates which come from deposits that vary widely in the mineral substances they contain and in the methods employed to produce them. The labor employed both for producing aggregates and mixing and placing concrete is local. Naturally, variations occur, but they have been reduced to such a minimum that they should not affect the strength or permanence of concrete in place. It is the pride of the rock products industries that this is true. Through the work of its manufacturers, portland cement has long been of standard quality, and good commercial aggregates are as nearly of standard quality as their local production will permit. Aggregate producers ask for as rigid specifications as commercial production will allow, and each year sees the wayside pit and dirty and unsound aggregate material put farther in the background. Today an engineer, anywhere in the United States, can obtain portland cement and cleaned and properly graded aggregates if he is willing to pay for them and he can rely upon the concrete made from them as surely as he can rely upon the strength of a steel beam.

As to the other criticisms, it may be pointed out that wherever failures in concrete have been studied the causes have been found to be poor aggregate or ignorant (or dishonest) handling of materials. Given good cement and aggregate it is up to the designer and the inspection force to see that they are properly combined and placed. Thanks to the Portland Cement Association, the American Concrete Institute and other national organizations, the knowledge of how to do this is everywhere available. It is in no way the fault of concrete as concrete if it is made of unfit materials or if good materials are improperly used in making it.

Concrete engineering is a living and a growing art and hence it has its difficulties and its problems, but the permanence and reliability of concrete per se are not among them. Unfair building codes, the dead hand of established practice and financial and other kinds of conservatism offer more barriers to the use of concrete than any disadvantages inherent in the material.

German and American Cement

German portland cement makers have recently tested 12 brands of American portland cements in the official laboratory of the German Cement Manufacturers Association, and they find that ordinary American portlands are better than ordinary German portlands in respect to tensile and compressive strengths, early hardening and post-hardening (after 28 days) qualities. With one exception, the American ordinary (or "standard") portlands were found not so good as the German *super-portlands*, or *"high-test" cements*, which are special products, selling at a higher price than ordinary portland cements.

There is nothing very new in these findings to those who are familiar with the qualities of American and foreign cements, but they are interesting as showing the effect of the policy of American cement makers on the quality of cement supplied by them to the open market. That policy has been to insist upon a single national minimum standard for portland cement (A. S. T. M. specifications). This insistence on a single standard or minimum quality has proved to be a firm base on which to erect the whole theory and practice of concrete engineering, but it has been criticized on the ground that it tended to keep all portland cement at a low level and to admit foreign cements which were just good enough to pass the standard specifications.

Whatever the effect on the admission of foreign cements, the effect on the American cement has been steadily and consistently to improve its quality, so much so that a recent raising of the specification requirements was met by practically all American portland cement manufacturers with their present product. And the makers of American portland cement have not been satisfied with this, but have continued to improve the quality independent of specification requirements.

The German laboratory found only one cement to compare with German super-portlands, but it would have found others by testing more samples. Furthermore, the knowledge of how to use standard American portland cement to bring out its quick-handling properties is helping to render the higher priced super-portlands unnecessary in a great many instances. Concrete pavements in the larger American cities are now opened to heavy traffic in three days, the work being done by regular contract and only standard American portland cement being used.

QUOTATIONS OF INACTIVE ROCK PRODUCTS SECURITIES

Stock	Date	Par	Price bid	Price asked	Dividend rate
Atlanta Shope Brick and Tile Co.[1]	Nov. 24	.....	25c	.....	
Benedict Stone Corp. (cast-stone) (100 sh. pfd. and 780 sh. com.)[1]	Nov. 10	.....	$4700 for the lot	.....	
Coplay Cement Mfg. Co. (common) (4)	Dec. 16	.....	12½	.....	
Coplay Cement Mfg. Co. (preferred) (4)	Dec. 30	.....	70	.....	
Eastern Brick Corp. 7% cu. pfd.) (1)	Dec. 9	10	40c	.....	
Eastern Brick Corp. (sand lime brick) (common) (2)	Dec. 9	10	40c	.....	
Edison Portland Cement Co. (common)[4]	Sept. 11	50	20c	.....	
Edison Portland Cement Co. (preferred)	Nov. 3	50	17½c(x)	.....	
International Portland Cement Co., Ltd. (preferred)	Mar. 1	.....	30	45	
Globe Phospate Co. ($10,000 1st mtg. bonds, $169.80 per $1000 paid on prin.)	Dec. 22	.....	$50 for the lot	.....	
Iroquois Sand & Gravel Co., Ltd. (2 sh. com. and 3 sh. pfd.) (1)	Mar. 17	.....	$12 for the lot	.....	
Limestone Products Corp. (150 sh. pfd., $50 par, and 150 sh. com., no par)	Dec. 22	.....	$60 for the lot	.....	
Missouri Portland Cement Co. (serial bonds)	Dec. 31	.....	104¾	104¾	3¼% semi-annual
Olympic Portland Cement Co. (g)	Oct. 13	.....	.....	£1⅝	
Phosphate Mining Co. (4)	Nov. 24	.....	1	.....	
River Feldspar and Milling Co. (50 sh. com. and 50 sh. pfd.) (1)	June 23	.....	$200 for the lot		
Rockport Granite Co. (1st 6's, 1934)[2]	Aug. 31	.....	90	.....	
Simbroco Stone Co. (pfd.)	Dec. 12	.....	.....	.....	$2 Jan. 1
Southern Phosphate Corp.[6]	Sept. 15	.....	1¼	.....	
Tidewater Portland Cement Co. (3000 sh. com.)	Dec. 22	.....	$6525 for the lot	.....	
Vermont Milling Products Co. (slate granules) 22 sh. com. and 12 sh. pfd. (6)	Nov. 3	.....	$1 for the lot	.....	
Wabash Portland Cement Co.[1]	Aug. 3	50	60	100	
Winchester Brick Co. (preferred) (sand lime brick) (3)	Dec. 16	.....	10c	.....	

(g) Neidecker and Co., Ltd., London, England. (1) Price obtained at auction by Adrian H. Muller & Sons, New York. (2) Price obtained at auction by R. L. Day and Co., Boston. (3) Price obtained at auction by Weilepp-Bruton and Co., Baltimore, Md. (4) Price obtained at auction by Barnes and Lofland, Philadelphia, Pa. (5) Price obtained at auction for lot of 50 shares by R. L. Day and Co., Boston, Mass. (x) Price obtained at auction by Barnes and Lofland, Philadelphia, on November 3, 1925. (6) Price obtained at auction by Wise, Hobbs and Arnold, Boston, Mass.

Standard Slag to Take Over Bessemer Limestone and Cement

ACCORDING to news reports, Wick & Co., Youngstown, Ohio, brokers, acting for the Standard Slag Co., Youngstown, Ohio, have offered to purchase control of the Bessemer Limestone and Cement Co., Youngstown, Ohio. The terms of the sale have been announced in a letter sent to the common stockholders by John Tod, president of the Bessemer company. Under the terms offered, the common stockholders are to receive $250 per share in cash, ex dividend of $5.50 December 3, contingent upon 80% of the stockholders consenting and upon a verification by independent auditors and engineers of the company's balance sheets and physical assets. The time limit to consummate the deal is set for February 1, 1927, but the letter intimates that the audit and appraisal will be completed by the first of the year, in which case cash payments for the stock will be made shortly after.

"If you wish to join with other stockholders," Mr. Tod writes, "which includes the officers and members of the board, in accepting the offer of Wick & Co., sign the enclosed stockholders' agreement promptly and send to the Dollar Savings and Trust Co., Youngstown."

This paragraph in the letter indicates that officers and directors, who hold approximately 70% of the common stock, are in favor of the sale of the stock and that they have deposited their agreements. The officers and directors have "approved and recommended" the acceptance of the offer, the letter says.

Last sales of the stock were around $135 a share a short time ago. Most of the stock in the company is held by the Butler, Tod and Stambaugh families, which organized the company and made a great success of it. There is $1,800,000 common and $1,000,000 preferred stock outstanding. In the five years ended with 1926 the company earned after all charges and allowing for preferred dividends an aggregate in excess of $125 a share, available for common.

The Bessemer Limestone and Cement Co. produces about 1,000,000 tons of blast furnace fluxstone at their quarry and plant at Walford, Penn., and makes shipments within a wide radius. It is one of the strong companies in the Youngstown district, the largest in that section of the country, with limestone reserves estimated at 600,000,000 tons. The company also owns and operates a large wet-process cement mill at Walford, Penn., with a daily production of about 3000 bbl. from three 10x175-ft. kilns, each equipped with an 8x60-ft. extension.

The Standard Slag Co. operates slag crushing plants located as follows: One at Ashland, Ky., 12 in Ohio and two in Pennsylvania. Recently the company has been identified with the newly organized Federal Portland Cement Co., which is planning the erection of cement mills at Cleveland and Chicago in addition to the mill at Buffalo which is now in the process of construction. L. A. Beeghly, who is president of the Federal company, is also president of the Standard Slag Co.

U. S. Gypsum Net to Equal 1925

ACCORDING to a director of United States Gypsum Co., earnings of the company this year will closely approximate those in 1925, when the net income amounted to $8,414,117, equal to $15.45 a share on 506,915 shares of common stock then outstanding. In the event that this estimate proves to be correct, earnings this year will amount to about $11.40 a share on the 684,335 shares which will be outstanding after the payment of the 35% stock dividend to be distributed December 31.

The company's showing this year is considered quite satisfactory in view of the lower prices that have prevailed in 1926 as compared with 1925. It is pointed out that reduced operating costs made it possible to report as favorable earnings as last year, the increased efficiency just about offsetting the average drop in the prices of the company's commodities. In this connection, it is learned that about $6,000,000 will have been expended for plant improvements by the end of the current year.

It is also understood that stockholders will be asked at an early date to increase the company's common capitalization. Practically all of the $15,000,000 authorized common stock will be outstanding after the distribution of the 35% stock dividend. The additional authorization will be necessary to take care of any further stock distributions, although no such payment is contemplated in the near future.

The management will probably continue its policy of paying regular common cash dividends at the rate of 8% annually, equal to $1.60 a share per year on the $20 par value common stock, with extra cash dividends and stock distribution when warranted. Extra cash dividends of $3.40 a share have been declared this year, while extra payments in 1925 amounted to $4 on each share of common stock. It is interesting to note, however, that the total cash outlay for the extra dividends was the same in both years, there having been a 15% stock distribution at the end of 1925. Should the company elect to follow the same procedure in 1927, extra cash dividends during the year would amount to $2.20 a share.

While officials of the company are reticent about making predictions for 1927, they point out that the volume of building is high at the present time but that profits will be dependent largely upon the price situation.—*Wall Street News (New York).*

New York Trap Rock Bonds Offered

WILLIAM R. COMPTON and E. H. Rollins & Sons, New York, are offering at 98½ and interest to yield over 6.125%, $6,500,000 first mortgage sinking fund gold bonds (closed mortgage) of the New York Trap Rock Corp., New York, dated Dec. 1, 1926, to mature Dec. 1, 1946. The following data are from a letter of Wilson P. Foss, chairman of the board:

Capitalization. The capitalization of the corporation upon completion of present financing will be as follows:

First mort. 6% s. f. gold bonds.....$6,500,000
7% s. f. gold debentures..... 1,250,000
Cumulative $7.00 pfd. stock (no par) ..... 20,000 sh.
Common stock (no par).....180,000 sh.

Business and Properties. The New York Trap Rock Corp., organized under the laws of the state of New York in 1918, through predecessor companies has been in the business of producing crushed stone for over 30 years. The corporation is acquiring the physical properties for the Tomkins Cove Stone Co., and will own five large-scale operating quarries located on the Hudson river, equipped with dock facilities for utilizing water transportation. Four of these quarries also have facilities for railroad loading.

The operating plants have been extensively developed for the economical production of crushed stone. A large part of the past earnings of the corporation have been invested in plant extensions and improvements. These improvements have increased the production as to quarries previously owned more than 100% in the past 6 years.

The property of the corporation will embrace 1,873 acres of quarry lands containing superior deposits of trap rock, dolomite and limestone, sufficient to supply raw material for at least 100 years, using as a basis twice the rate of production of 1925. Reserve properties are located on navigable waters at East Haven, Conn., adjacent to Long Island Sound, one at Kingston, N. Y., adjacent to the Hudson River, and one at Little Falls, N. Y., on the State Barge Canal. The business of the New York Trap Rock Corp. is unusually simple of operation, the raw material being converted in less than 20 minutes into finished product, which is delivered and sold in an average of less than 36 hours, thus eliminating the uncertainties and dangers of large inventories.

Market. The products of the corporation include crushed trap rock and dolomite which because of their unusual wearing qualities are given preference for highway work, ballast and concrete construction work. The demand for these products is constantly increasing and, for each of the years since the organization of the corporation, has been in excess of production. The territory served embodies a population estimated at approximately 10,500,000, including the entire metropolitan area of New York City and adjacent territory from New Brunswick, N. J., to Troy, N. Y.

Transportation Facilities. With each of the operating quarries having water transportation and all but one rail transportation as well, the corporation holds a strategic position in supplying the world's greatest market. In delivery to New York City and the metropolitan territory, water transportation shows a differential of approximately $.75 per cubic yard over rail shipment and permits delivery to a larger number of points than can be reached by rail without additional cost of re-handling. The corporation owns 84 barges which are used in the delivery of its products.

Security and Assets. These bonds will be direct obligations of the New York Trap Rock Corp., and will be secured by a closed first mortgage on all its fixed assets and those being acquired, including quarry lands, buildings, machinery, barges, equipment, etc. The J. G. White Engineering Corp. values the five operating properties and barges at $16,630,000, which is in excess of $2,500 for each $1,000 bond of this issue. The balance sheet of the corporation giving effect to this financing shows current assets of over four times current liabilities.

Sinking Fund. The indenture securing this issue of bonds will provide for a sinking fund of $250,000 a year for the first 10 years and $300,000 a year for the second 10 years, payable semi-annually beginning June 1, 1927, such payments to be augmented by an amount equal to 10% of the cash dividends paid at any time on the common stock. The sinking fund shall be available for the purchase of bonds in the open market at prices below the call price or for the call of bonds by lot. Bonds shall be subject to call at 30 days' notice at 105 plus accrued interest during the first 10 years and at one-half per cent less for each of the succeeding years.

Earnings. The consolidated net income for the past three years of the corporation and the properties and business being acquired available for interest but before depreciation, depletion and Federal income taxes, as certified by Messrs. Haskins and Sells, have been as follows:

1924	$1,470,216.25
1925	1,581,707.94
*1926	1,824,947.96

*November and December estimated.

The $1,625,624 average annual earnings for the above period are in excess of 4.1 times maximum annual interest requirements of this issue and in excess of 2.5 times combined maximum annual interest and minimum fixed sinking fund charges on this issue.

For the year 1926 (two months estimated) such earnings are in excess of 4.6 times maximum annual interest requirements on the first mortgage bonds. Earnings available for interest for the year 1927 are estimated in excess of $2,000,000.

CONDENSED CONSOLIDATED BALANCE SHEET, NEW YORK TRAP ROCK CORP. AND SUBSIDIARIES, OCTOBER 31, 1926

(After giving effect to proposed acquisition of certain properties of the Tomkins Cove Stone Co. and proposed new financing)

ASSETS

Current Assets:		
Cash	$ 382,304.74	
Notes receivable	82,789.56	
Accounts Receivable:		
Customers $1,272,558.94		
Others, 5.726.95		
Total, $1,278,285.89		
Less reserve for doubtful accounts, 9,709.03	1,268,576.86	
Inventories (book quantities, said to be priced at cost; not verified under audit):		
Materials and supplies	236,614.12	
Crushed stone	3,960.00	
Total current assets		$ 1,974,245.28
Property:		
Land, buildings, machinery and equipment	$14,820,106.95	
Property of subsidiary company not subject to mtge.	152,575.48	
Marine equipment	818,712.51	
Total property		$15,791,394.94
Due from New York Central Railroad Co. (deferred pending completion of excavations, etc., in connection with their purchase of right of way at Clinton Point)		32,000.00
Investment in Verplanck Shipyard and Repair Corp. (30 shares of common capital stock, at par value)		3,000.00
Liberty Bonds and New York City bonds deposited with the state industrial commission		27,227.47
Deferred Debit Items:		
Prepaid insurance, taxes, interest, etc.	$34,253.07	
Miscellaneous	3,826.06	
Total deferred debit items		38,079.13
Total		$17,865,946.82

LIABILITIES

Current Liabilities:		
Accounts payable	$ 361,039.31	
Fed. inc. tax (4th installment, 1925 tax)	24,083.49	
Reserve for bonus	84,356.94	
Other	3,932.18	
Total current liabilities		$ 473,411.92
Funded Debt:		
20-yr. 1st mtge. 6% sinking fund gold bonds	$ 6,500,000.00	
10-yr. 7% sinking fund gold debentures	1,250,000.00	
Total funded debt		$ 7,750,000.00
Reserves:		
Depreciation:		
Quarry bldgs. and equipment	$ 949,999.91	
Property of subsidiary not subject to mortgage	26,558.39	
Marine equipment	106,722.03	
Depletion	106,603.23	
Fed. inc. tax accrued, 10 mos. ended Oct. 31, 1926	139,250.00	
Repairs and conditioning, compensation ins. claims, and contingencies	54,370.89	
Total reserves		$ 1,383,504.45
Equity of minority shareholders of Carbonate of Lime Corp.		77,999.24
Capital Stock and Surplus:		
Pfd. (20,000 shares of no par value)	$ 2,000,000.00	
Common stock (180,000 shares of no par value)	5,844,874.28	
Capital surplus (representing part of appreciation of property taken in accts. in 1918)	336,156.93	
Total capital stock and surplus		$ 8,181,031.21
Total		$17,865,946.82

NOTE: The New York Trap Rock Corp. was contingently liable at October 31, 1926, on account of notes receivable discounted in the amount of $34,516.15.

Purpose of Financing. The proceeds from this issue of bonds and from $1,250,000 of 7% sinking fund gold debentures will be used to purchase the physical assets of the Tomkins Cove Stone Co. and the crushed stone business of the Calvin Tomkins Co. (selling company for Tomkins Cove Stone Co.), to retire the present funded indebtedness of the corporation.

Dividends Declared

Company	Rate	Payable
Atlas Portland Cement Co. (com.)	50c qu.	Jan. 12
Atlas Portland Cement Co. (com.)	$1 ex.	Jan. 12
Canada Cement Co. (com.)	2% qu.	Jan. 4
Canada Cement Co. (pfd.)	1¾% qu.	Jan. 4
Dolese and Shepard	1.50 qu.	Jan. 1
Dolese and Shepard	1.50 ex.	Jan. 1
Ideal Cement Co. (com.)	$1 qu.	Dec. 15
Ideal Cement Co.	$1 ex.	Dec. 15
Ideal Cement Co. (pfd.)	1¾% qu.	Dec. 15
Kelley Island L. & T. Co.	$2 qu.	Jan. 2
Kelley Island L. & T. Co.	$2 ex.	Jan. 2
Arundel Corp.	45c qu.	Jan. 3
Arundel Corp.	20c ex.	Jan. 3
Boston Sand and Gravel Co. (com.)	1% qu.	Jan. 1
Boston Sand and Gravel Co. (com.)	2% ex.	Jan. 1
Boston Sand and Gravel Co. (pfd.)	1¾%	Jan. 1
Boston Sand and Gravel Co. (pfd.)	2%	Jan. 1
Charles Warner (com.)	75c	Jan. 12
Charles Warner (pfd.)	1¾%	Jan. 27
Sandusky Cement (com.)	$2 qu.	Jan. 1
Sandusky Cement	$4 ex.	Jan. 1
Santa Cruz P. C. Co. (com.)	$1 qu.	Jan. 1
Santa Cruz P. C. Co.	$1 ex.	Jan. 1

Portland Cement Output in November

Production and Shipments Increase Over November, 1925—Record Totals Probable for 1926

NOVEMBER production of portland cement shows an increase of about 4% and shipments an increase of nearly 11% as compared with November a year ago, according to the Bureau of Mines, Department of Commerce. Portland cement stocks at the end of November, 1926, were almost 22% higher than at the end of the preceding month, and were nearly 12% greater than the stocks at the end of November, 1925.

These statistics, prepared by the Division of Mineral Resources and Statistics of the Bureau of Mines, are compiled from reports for November, 1926, received direct from all manufacturing plants except two, for which estimates were necessary on account of lack of returns.

Clinker Stocks

Stocks of clinker, or unground cement, at the mills at the end of November, 1926, amounted to about 5,762,000 bbl. compared with 5,394,000 bbl. (revised) at the beginning of the month.

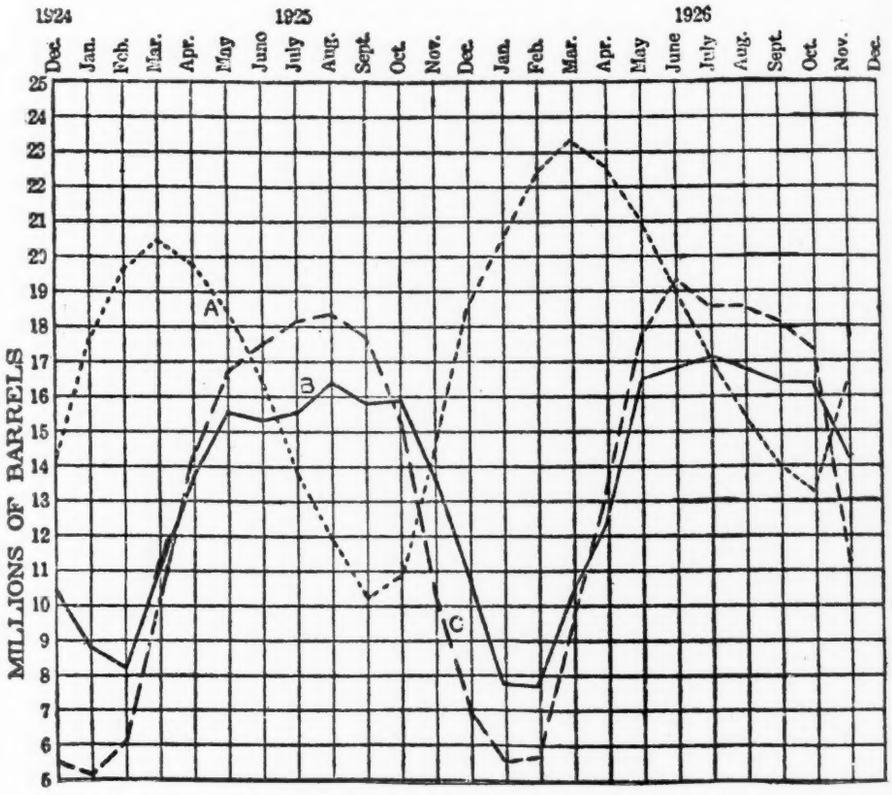
An estimate of the unground clinker by months is given below.

ESTIMATED CLINKER (UNGROUND CEMENT) AT THE MILLS AT END OF EACH MONTH, 1925 AND 1926, IN BARRELS

Month	1925	1926
January	7,017,000	9,074,000
February	8,497,000	10,931,000
March	9,962,000	12,284,000
April	9,731,000	12,934,000
May	9,053,000	11,649,000
June	7,937,000	10,086,000
July	6,961,000	8,515,000
August	5,640,000	7,362,000
September	4,561,000	6,095,000
October	4,086,000	*5,394,000
November	5,013,000	5,762,000
December	6,469,000	.....

*Revised.

MONTHLY FLUCTUATIONS IN PRODUCTION, SHIPMENTS AND STOCKS OF FINISHED PORTLAND CEMENT



(A) Stocks of finished portland cement at factories. (B) Production of finished portland cement. Shipments of finished portland cement from factories

Distribution of Cement

The following figures show shipments from portland cement mills distributed among the states to which cement was shipped during the months of September and October, 1925 and 1926.

PORTLAND CEMENT SHIPPED FROM MILLS INTO STATES, IN SEPTEMBER AND OCTOBER, 1925 AND 1926, IN BARRELS*

Shipped to—	1925—Sept.—	1926	1925—Oct.—	1926
Alabama	192,882	153,636	158,310	169,086
Alaska	455	668	528	132
Arizona	34,380	42,709	33,577	44,360
Arkansas	54,377	75,962	52,339	70,785
California	1,120,092	1,204,615	1,125,094	1,276,210
Colorado	122,128	137,054	103,024	113,951
Connecticut	232,265	255,785	230,906	242,167
Delaware	63,024	46,600	63,752	44,898
District of Columbia	84,260	94,183	94,295	90,347
Florida	522,465	315,214	535,817	343,404
Georgia	134,340	160,377	134,198	148,699
Hawaii	3,511	17,179	8,086	16,887
Idaho	24,959	34,221	21,228	33,444
Illinois	1,658,700	1,458,052	1,257,184	1,918,899
Indiana	625,962	646,062	476,635	719,882
Iowa	368,763	350,251	259,971	501,683
Kansas	205,607	226,069	215,258	244,497
Kentucky	196,628	246,310	139,790	192,177
Louisiana	80,907	108,642	77,948	123,139
Maine	40,051	90,934	40,243	47,136
Maryland	260,019	249,489	196,739	270,241
Massachusetts	326,615	358,853	349,702	305,190
Michigan	1,195,566	1,372,831	992,423	1,159,596
Minnesota	455,011	407,570	376,854	384,739
Mississippi	56,979	79,924	41,777	68,149
Missouri	597,568	457,632	505,730	498,449
Montana	24,598	30,597	19,205	27,916
Nebraska	206,703	169,159	193,568	173,552
Nevada	10,598	10,291	10,048	7,955
New Hampshire	48,675	56,092	52,975	44,983
New Jersey	809,251	866,717	847,301	856,615
New Mexico	12,945	17,738	15,687	22,127
New York	2,006,604	2,490,511	1,880,822	2,107,119
North Carolina	354,835	412,719	328,705	382,736
North Dakota	33,458	46,528	28,020	30,647
Ohio	1,118,150	1,137,722	870,645	989,005
Oklahoma	195,542	219,399	212,696	188,144
Oregon	157,333	150,679	155,066	126,946
Pennsylvania	1,937,173	1,620,018	1,490,931	1,415,233
Porto Rico	346	0	0	0
Rhode Island	71,846	56,575	84,229	72,653
South Carolina	82,742	55,967	69,548	61,636
South Dakota	56,838	47,794	41,532	48,761
Tennessee	171,080	239,051	118,768	203,406
Texas	328,962	430,727	290,946	441,775
Utah	44,564	56,948	40,238	64,504
Vermont	28,794	50,697	31,509	34,591
Virginia	184,071	191,720	156,782	151,319
Washington	258,182	202,117	254,164	191,453
West Virginia	201,698	188,894	193,757	143,112
Wisconsin	513,479	594,999	285,712	582,919
Wyoming	20,461	23,893	16,522	15,475
Unspecified	74,427	73,748	36,326	13,132
	17,610,869	18,032,122	15,217,110	17,425,861
Foreign countries	100,131	54,878	91,890	60,139
Total shipped from cement plants	17,711,000	18,087,000	15,309,000	17,486,000

*Includes estimated distribution of shipments from three plants in September and October, 1925; and from five plants in September and October, 1926.

PRODUCTION, SHIPMENTS AND STOCKS OF FINISHED PORTLAND CEMENT, BY MONTHS, IN 1925 AND 1926, IN BARRELS

Month	Production 1925	Production 1926	Shipments 1925	Shipments 1926	Stocks at end of month 1925	Stocks at end of month 1926
January	8,856,000	7,887,000	5,162,000	5,674,000	17,656,000	20,582,000
February	8,255,000	7,731,000	6,015,000	5,820,000	19,689,000	22,384,000
March	11,034,000	10,355,000	10,279,000	9,539,000	20,469,000	23,200,000
First quarter	28,145,000	25,973,000	21,456,000	21,033,000		
April	13,807,000	12,401,000	14,394,000	12,961,000	19,877,000	22,640,000
May	15,503,000	16,472,000	16,735,000	17,951,000	18,440,000	21,173,000
June	15,387,000	16,827,000	17,501,000	19,113,000	16,409,000	18,900,000
Second quarter	44,697,000	45,700,000	48,630,000	50,025,000		
July	15,641,000	17,096,000	18,131,000	18,786,000	13,896,000	17,210,000
August	16,419,000	16,936,000	18,383,000	18,536,000	11,952,000	15,718,000
September	15,939,000	16,571,000	17,711,000	18,087,000	10,247,000	14,195,000
Third quarter	47,999,000	50,603,000	54,225,000	55,409,000		
October	15,992,000	16,596,000	15,309,000	17,486,000	10,979,000	*13,334,000
November	13,656,000	14,193,000	10,187,000	11,290,000	14,534,000	16,237,000
December	10,713,000		6,917,000		18,515,000	
Fourth quarter	40,361,000		32,413,000			
	161,202,000		156,724,000			

*Revised.

PRODUCTION, SHIPMENTS AND STOCKS OF FINISHED PORTLAND CEMENT, BY DISTRICTS, IN NOVEMBER, 1925 AND 1926, AND STOCKS IN OCTOBER, 1926, IN BARRELS

Commercial district	Production 1925	Production Nov.—1926	Shipments 1925	Shipments Nov.—1926	Stocks at end of 1925	Stocks at end of Nov.—1926	Stocks at end of October, 1926*
E'n Penn., N. J. & Md.	3,457,000	3,617,000	2,909,000	3,356,000	1,353,000	2,697,000	2,437,000
New York	872,000	820,000	609,000	609,000	670,000	896,000	685,000
Ohio, W'n Penn. & W. Va.	1,241,000	1,157,000	852,000	1,067,000	1,904,000	2,151,000	2,062,000
Michigan	988,000	1,227,000	585,000	781,000	1,318,000	1,471,000	1,026,000
Wis., Ill., Ind. & Ky.	1,941,000	1,930,000	1,211,000	1,143,000	2,882,000	2,084,000	1,296,000
Va., Tenn., Ala. & Ga.	1,192,000	1,290,000	754,000	1,233,000	722,000	1,124,000	1,067,000
E'n Mo., Ia., Minn. & S. Dak.	1,220,000	1,310,000	769,000	602,000	2,422,000	2,317,000	1,609,000
W'n Mo., Neb., Kan. & Okla.	859,000	821,000	818,000	739,000	1,559,000	1,538,000	1,455,000
Texas	399,000	402,000	356,000	427,000	426,000	381,000	406,000
Colo., Mont. & Utah	95,000	200,000	128,000	156,000	453,000	450,000	406,000
California	1,099,000	1,154,000	1,029,000	972,000	529,000	662,000	480,000
Ore. & Wash.	293,000	265,000	167,000	205,000	296,000	466,000	405,000
	13,656,000	14,193,000	10,187,000	11,290,000	14,534,000	16,237,000	13,334,000

*Revised.

IMPORTS OF HYDRAULIC CEMENT BY COUNTRIES AND BY DISTRICTS, IN OCTOBER, 1926

Imported from	District into which imported	Barrels	Value
Belgium	Los Angeles	54	$114
	Maine & N. H.	11,998	51,610
	Massachusetts	82,552	90,499
	Mobile	57,048	100,066
	New Orleans	39,557	51,388
	Oregon	2,997	4,857
	Philadelphia	39,373	60,726
	Washington	3,003	4,185
	Total	236,582	$363,445
Canada	St. Lawrence	506	$939
	Vermont	222	374
	Total	728	$1,304
Denmark and Faroe Islands.	Porto Rico	6,780	$11,208
France	New Orleans	655	$1,890
	New York	739	2,368
	Total	1,394	$4,258
Germany	New Orleans	2,859	$2,285
Japan and Chosen	Hawaii	2,496	$4,898
Netherlands	Maine & N. H.	9,035	$18,720
United Kingd'm	Massachusetts	500	$787
	New York	2,979	5,510
	Total	3,479	$6,297
	Grand total	263,403	$412,415

EXPORTS AND IMPORTS*
EXPORTS OF HYDRAULIC CEMENT BY COUNTRIES IN OCTOBER, 1926

Exported to—	Barrels	Value
Canada	2,431	$12,374
Central America	14,136	37,033
Cuba	8,065	20,759
Other West Indies	6,565	15,178
Mexico	4,862	16,208
South America	29,449	101,110
Other countries	3,881	23,212
	69,389	$225,874

DOMESTIC HYDRAULIC CEMENT SHIPPED TO ALASKA, HAWAII AND PORTO RICO IN OCTOBER, 1926*

	Barrels	Value
Alaska	633	$ 1,935
Hawaii	17,014	38,377
Porto Rico	5,195	11,865
	22,842	$52,177

*Compiled from the records of the Bureau of Foreign and Domestic Commerce and subject to revision.

American and German Portland Cements Compared

AN INTERESTING comparison of American and German portland cements is reported in a recent issue of the German journal, *Zement*. The work was carried on by Dr. G. Haegermann, Karlshorst, Germany. For this investigation, 12 different brands of American portland cements and one white cement were tested, according to German standard methods and compared with the average figures for ordinary German portland and high portland cements.

The results of these tests are said to show that the rate of setting is about the same in American and ordinary German portland cements; the German high portland cements having a more rapid set than either of the others. Difference in density and specific gravity in the American and German cements were of little consequence.

The American cements in fineness lay between the ordinary German portland cements and the high portland cement. Three- and 7-day compressive strengths gave lower figures for the American cements but on the 28-day test, the American cements were found to have a greater strength than the German average for that time. Increases of 29 to 43 lb. per sq. in. over the average tensile strength of German portland cements were reported. In making all these determinations, a 1:3 mix was used. All the American cements tested had good post-hardening qualities.

The author's conclusions are that the American portland cements as a rule do not have as great tensile or compressive strengths as German high portland cements. Of the 12 American cements under investigation only one gave results comparable with the average German high portland cements. The chemical analyses of American and German portland cements show that the main differences between the two are that the lime is lower and the magnesia and silica higher in the American portland cements.

Lime in Earth Roads

"OUT OF THE MUD WITH LIME" (Bulletin 317) is the title of the latest bulletin issued by the National Lime Association. This attractively printed 16-page bulletin is well illustrated and shows the lime treatment of earth roads.

EXPORTS AND IMPORTS OF HYDRAULIC CEMENT, BY MONTHS, IN 1925 AND 1926

Month	Exports 1925 Barrels	Exports 1925 Value	Exports 1926 Barrels	Exports 1926 Value	Imports 1925 Barrels	Imports 1925 Value	Imports 1926 Barrels	Imports 1926 Value
January	71,596	$ 207,547	72,939	$216,431	231,258	$ 364,196	360,580	$576,717
February	56,249	181,356	73,975	220,706	119,077	206,308	314,118	527,948
March	65,248	200,410	69,080	205,647	218,048	337,039	493,241	812,968
April	89,508	263,831	96,296	284,772	197,686	280,826	257,302	398,114
May	85,385	250,845	78,601	224,365	186,897	286,959	223,130	337,031
June	71,343	217,899	80,684	248,814	254,937	409,539	335,570	495,744
July	98,141	286,543	130,822	376,220	335,118	499,602	250,862	395,981
August	103,961	289,904	64,946	216,489	379,847	611,551	350,638	560,532
September	102,649	285,225	70,920	239,174	513,252	789,121	194,129	308,224
October	73,369	228,467	69,389	225,874	535,050	824,268	263,403	412,415
November	101,825	294,201			388,604	678,518		
December	100,323	296,900			295,543	526,001		
	1,019,597	$3,003,128			3,655,317	$5,813,928		

Missouri Valley Sand and Gravel Producers Meeting

ALTHOUGH the members of the Missouri Valley Sand and Gravel Producers Association operate in a locality which, as a whole, has shown rather a decrease than an increase in business the past year, the annual meeting of the association was well attended and the members found plenty of live subjects to discuss. Socially, the meeting was the success that it always is, the entertainment, furnished by the Kansas City producers, including lunches for both days of the session, a theater party Monday night and an informal dinner Tuesday night.

"Cap" Stewart, the retiring president, made an excellent opening address in which he reviewed the work of the association during the year. He said that it had been unusually gloomy at the start not only from the fact that business was poor but also because the formation of the Consumer's Sand Co. of Topeka had combined a number of member companies into a single company, which it was at first thought would mean a loss of members. But it had not worked out as expected and it was now seen that the "merger" was for the good of the whole industry.

Needs of the Association

The executive committee held six meetings in different parts of the association's territory during the year, and while they could not point to any increase in membership as a result of these they could point to important results of the intangible kind. In some places they were able to solve local problems and place the industry on a firmer basis. One of the most important acts of the executive committee was the securing of E. E. Scholer, an engineer of standing, to assist members not only in production problems, but in seeing that the advantages of good, clean aggregate were brought before the consumers of the product. He called attention to the need for some consideration of state laws regarding contract work in which sand and gravel were used and mentioned that one contractor received $1.59 per yd. for the same paving in Kansas that he got $2.57 for in Missouri and yet made more money in Kansas, because in Missouri he had to collect tax bills to get his money. If paving was as cheap in Missouri as in Kansas he believed that a lot more of it would be done and the producers would benefit. The right kind of legislation would bring this about. As things are now, Kansas towns have about three times as much paving as Missouri towns of the same size. In closing he thanked the officers and members of the executive committee for their unusually efficient co-operation during the past year.

Reports by Districts

Reports from the different districts were then called for. F. A. Langhead spoke first on conditions in the Upper Kaw river district. He said that his company (the Consumer's Sand Co. of Topeka) was new and had had to make a start under new conditions but they had found business normal and the prospects for the future were satisfactory, especially good for the Kansas territory. He was followed by Mr. Gades of the same company who spoke of the need of a more progressive road program in Kansas by which all the producers would benefit. In answer to a question about new

N. C. Dunn, newly elected president of the association

plants in the district he said that the Lawson Sand Co. had begun operations in Lawrence, Kansas, and another plant had begun to operate at Kasota, Kansas. He mentioned one bit of sharp practice which some producers in his district had followed which he thought should be declared as unethical, that of calling up a "regular" customer of a company and getting an order for a car or two of sand by allowing the purchaser to believe he was buying from the producer who regularly supplied him with sand, perhaps on a long contract.

John Prince of the Stewart Sand Co., Kansas City, Mo., spoke of the Lower Kaw district, which includes Kansas City. This district is greatly influenced by business conditions in Kansas City and these had not been of the best. There had been a considerable decline in all forms of general construction and at least three new companies had entered the field, which meant that a lessened business had to be divided among more producers. The decline in building permits had amounted to 45% as compared with 1925. The last thing the district needs at the present time is an increase in production. The delivered price had dropped about 15 cents a ton, due to an overplus of sand produced, although the plant price had so far remained firm. As for 1927 he would be well satisfied if the tonnage equalled that of 1926, taking into consideration all the factors of general business and agricultural conditions in the district and the outlook for building.

Good Prospects for Oklahoma

W. E. Rogers, who reported for the Oklahoma territory, gave the first cheerful notes that were heard in the meeting. His company, the Arkansas River Sand Co. of Tulsa, had had a fair year and the prospects for 1927 were excellent because the prospects for Oklahoma were so good. He said that every morning paper brought news of some new construction planned. Some of these were a new scrap-steel mill for Sand Springs, a new depot for Tulsa, a 20-story office building and a big dam to be built on the Grand river. To offset these good things it must be admitted that there was an overproduction of sand in Oklahoma and that there was a bad highway situation, partly due to the fact that the counties were trying to get the highway building away from the state board and back into their own hands. On the whole, however, prospects were for at least as good a year in 1927 as in 1926. J. M. Chandler (Price Sand Co., Tulsa) said that things probably looked rosy to Mr. Rogers because he had just become an "oil millionaire," a successful well having been drilled on his property at Sand Springs.

N. C. Dunn (Arkansas City Sand Co., Arkansas City, Kansas) spoke for the Arkansas river district. He, too, had a pleasanter story to tell than some of the speakers who preceded him for he said that he thought the production of the district would show up with something like a 35% increase. A considerable part of this went into road work. The future of the district depends on what kind of a road program is adopted for 1927. River conditions had been fair except for one flood which raised the river 25 ft. and which did some damage.

Referring to what Mr. Dunn had said about river conditions Mr. Prince called the members' attention to the work of the river commission and said that members should see that the commission gets some data of revenue for river protection work.

Conditions in the Missouri river district were reported by A. E. Fisher of the Glascom (Mo.) Sand and Gravel Co. since H. E. Moore, who was to have made the report, could not be present. Mr. Fisher said that highway work in his district has apparently reached a peak and from now on there will be less of it rather than more. No plant in the district had done as much in 1926 as in 1925 and it looks as though production in 1927 would drop back to that of 1924, which might be considered normal.

River conditions had not been normal as there had been both unusually high and unusually low river stages and these had come at unusual times.

This year has seen some competition in the district from sands shipped in from points on the Mississippi river.

E. E. Dresser (Dresser Sand Co., Leavenworth, Kansas) said business had been practically the same as in 1925. Capt. Stewart, whose plant is on the Missouri river, said he anticipated that business would be better in 1927 as towns and cities would build roads to connect with the main highways. There is also a considerable amount of paving planned in the towns themselves, and for these reasons he considered the prospects at least fair.

An address by J. C. McQuide, district manager of the Blaw-Knox Co., had to be omitted as Mr. McQuide could not be present at either day's session.

Problems for the National Convention

The afternoon session began with an address by Stanton Walker, director of the Research Division of the National Sand and Gravel Association. Mr. Walker spoke of the work which the division is doing and said its greatest value had been found to be work for individual members, and he gave some instances to illustrate what he meant. A great deal of time had to be spent in getting information desired by member companies. One inquiry had called for a fairly complete study of the relation of the density of aggregates to the density of concrete. Contacts with the A. S. T. M. and A. C. I. and other national bodies had to be maintained and this took much time. At present these bodies were making national specifications for sand and gravel and it is important that such specifications consider the position of the producer. The division had also cooperated with the Portland Cement Association and the National Lime Association. The Portland Cement Association had hitherto confined its work to grading of aggregate rather than to types of aggregate. They had recently requested considerable information regarding gravel and the problems of the gravel producer. The National Lime Association was interested in plaster sand, a subject about which no one knows very much at the present time. He discussed national specifications for sand and gravel to be used as concrete aggregates and said that no one specification could cover the whole country; specifications should be drawn so that such matters as grading could be left to local bodies.

In closing he spoke of the coming national convention and told of some of the topics that would be discussed and of the speakers who would address the meetings in Cincinnati. Much of Mr. Walker's talk is not reported here as it treated of matters which will be discussed in fuller detail at the National Association convention.

The members were greatly interested in a little demonstration given by Mr. Walker to show that the yield of concrete is greater with well-graded than with poorly-graded aggregates. He mixed for each test a half tumbler of cement with a half tumbler of water and then stirred in the aggregates until the members agreed that the consistency was the same. One aggregate was a fine sand (with a fineness modulus of 1.70) and the other a rather coarse concrete sand (fineness modulus 3.20). From the first he got a little less than one and one-half tumblers full of mortar and from the second he got two full tumblers. Roughly, the better graded aggregate gave 25% more concrete, and it is easy to figure out that a contractor would be better off if he paid more than the regular price for a well-graded sand than if he used the poorly graded sand and got it for nothing.

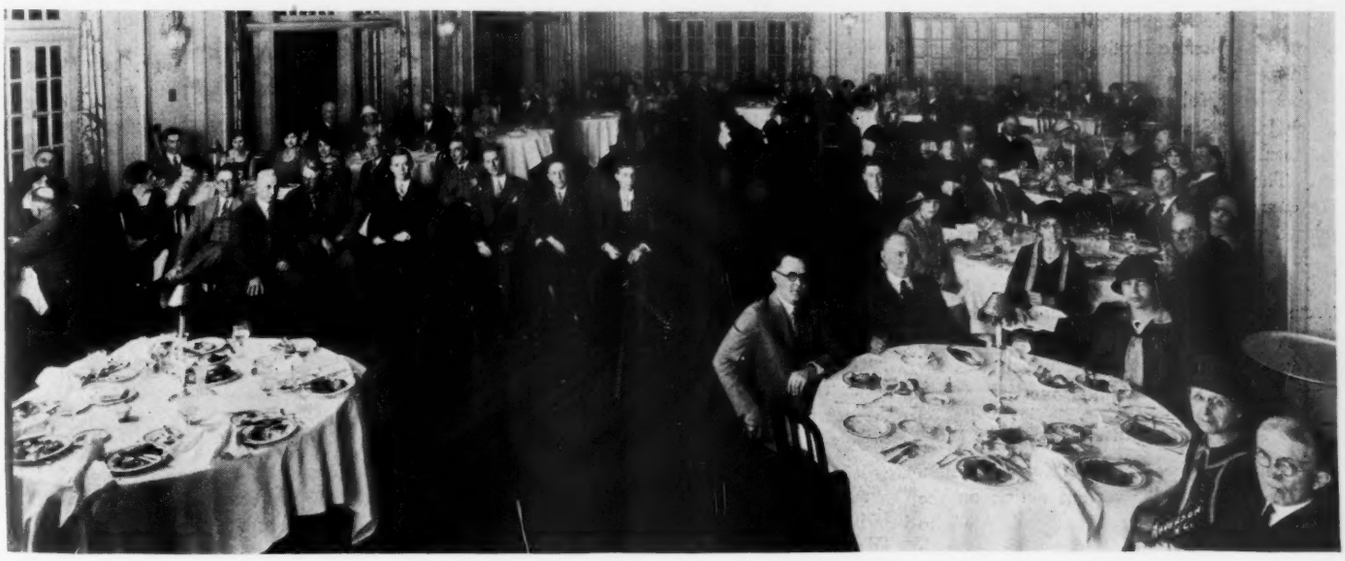
A Bad Sand Specification

E. E. Sholer, the newly-appointed engineer of the association, said that it was reported that Kansas had just adopted a state highway specification for sand which accepted sand with a fineness modulus of 1.70 or greater. Mr. Prince pointed out that this was the same as having no specification at all. He thought the demonstration of Mr. Walker showed that such sand was unfit for use in concrete.

The remainder of the session and much of the sessions of the next day were given to a discussion of arrangements with the lumbermen who act as retail dealers in the smaller towns and cities. There was a considerable difference of opinion as to whether the producing companies should sell wholly through dealers in those places where they had no retail yards of their own. Producers do this in certain districts but not in others. Nothing could be done by the association as a whole but it was thought well to have the matter discussed and to hear arguments for both ways of doing business.

Car Coopering

Car "coopering" was a subject that also occupied the meeting's attention for several hours Tuesday. It seems that conditions on some lines in this territory are growing worse instead of better as some of the railroads have sent cars which were almost impossible to repair at a reasonable cost to plants. One producer reported that it cost him $1 for every car loaded in the past season. Frank Peck thought the difficulty would disappear as so many steel cars were coming into use but Capt. Stewart said that he had found the steel cars to be harder to repair than the wooden cars, as so many of them had been damaged by unloading with heavy clamshell buckets which bent certain parts so that the doors would not close. J. M. Chandler said that every producer in the association should keep an accurate account of time and material spent on each car repaired, with the car number. If this was done for three months there would be such a showing that the railroads would see



Banquet of the Missouri Valley Sand and Gravel Producers held in the Kansas City Athletic Club

the unfairness of asking producers to use such equipment. O. W. Knight said that the greater part of the money was spent on a few "old cripples," which never should be set in to a plant. Mr. Chandler said it was his practice to refuse to load such cars and he thought that all the producers should refuse to load them and thus compel the roads to furnish usable cars. It seemed to be the sense of the meeting that no one objected to cleaning cars and filling cracks with hay or sacks and occasionally nailing a board over a crack, but no member thought that producers should be compelled to make large repairs on car bodies, which would involve the work of two or three men for several hours and perhaps consume several dollars' worth of lumber. No action was taken by the members as an association but it is understood that the directors will try to formulate some method of dealing with the burden of car repairing.

The officers and directors elected for the following year are:

N. C. Dunn, president; H. E. West, vice-president; Otto Kuehne, secretary and treasurer. Directors for the various districts: John Prince, Upper Kaw; O. W. Knight, Lower Kaw; J. M. Chandler, Oklahoma; H. E. Moore, Missouri River; F. H. Gades, Arkansas River; R. J. Stewart, member ex officio.

Those present were:

F. A. Langhead, A. M. McQuoin, H. H. Allison, H. N. Richardson, F. H. Gades, D. L. Denise and F. G. Wear, all of Consumers' Sand Co., Topeka, Kan.
John Prince, Geo. H. Cook, W. J. Stewart, E. L. Kirkham, E. L. Miller and W. J. Gish, Stewart Sand Co., Kansas City, Mo.
F. W. Peck, L. E. Leach, W. A. Pirnie, E. E. Woodson and F. M. Colburn, Muncie Sand Co., Kansas City, Mo.
H. B. Thompson, A. E. Wallace and John R. Carroll, American Sand Co., Kansas City, Mo.
R. J. Stewart and Bernard Feenex, Pioneer Sand Co., St. Joseph, Mo.
F. M. Henry, Peck-Thompson Sand Co., Kansas City, Mo.
Otto Kuehne, Jr., Kansas Sand Co., Topeka, Kan.
E. C. Dresser, Dresser Sand Co., Leavenworth, Kan.
H. E. West, West Sand Co., Muskogee, Okla.
J. M. Chandler, Price Sand Co., Tulsa, Okla.
N. C. Dunn, Arkansas City Sand Co., Arkansas City, Kan.
L. A. Daly, J. A. Daly Sand Co., Nevada, Mo.
W. E. Rogers, Arkansas River Sand Co., Tulsa, Okla.
A. E. Fisher, Glasgow Sand Co., Glasgow, Mo.
O. M. Knight, River Sand Co., Topeka, Kan.
Fred Ratcliff, Tulsa Sand Co., Tulsa, Okla.
E. E. Sholer, engineer, Missouri Valley Sand and Gravel Producers Association.
Stanton, Walker, Chief of Research Division, National Sand and Gravel Association.
A. Blakemore, American Manganese Steel Co., Chicago Heights, Ill.
W. H. T. Bennett, Chicago.
R. A. Goodwin, "Cement, Mill and Quarry," Chicago.
Edmund Shaw, "Rock Products," Chicago.

New York State Crushed Stone Men Hold Annual Meeting

THIRTY-TWO members and guests of the New York State Crushed Stone Producers Association gathered in the Ten Eyck hotel in Albany to attend the association's annual meeting on Dec. 14. In the morning session the first matter discussed was the unpaid balance of what was pledged to the national association. This was disposed of by voluntary assessments made by several member companies. Self-insurance was then introduced by a talk by John Odenbach in which he gave the plan pursued by his company (the Dolomite Products Co., Rochester) in full detail.

This was followed by a discussion in which James Savage and E. B. Johnson gave the results of their investigation of the matter. The rate which it is proposed to assess the quarries in the coming year was considered exhorbitant and the suggestion was made that the association start its own mutual insurance company. The proposal was discussed by President Seitz and others and finally, on a motion by F. W. Schmidt, it was referred to a committee which was instructed to report at a later meeting.

Adopt Association Emblem

The emblem then came up for discussion. After rescinding all previous action on the matter the association finally decided to adopt the emblem which has already been shown in Rock Products, giving the name of the association in connection with a map of the state.

Standardization of sizes was the next subject presented and the committee reported that nothing new had developed. A. T. Goldbeck, Director of Research of the National Association, who had come up from Washington to address the meeting on this subject, made a talk in which he explained fully the importance of standardization of sizes to the industry as a whole. He stated that a committee of the National Association, headed by Col. Chamberlain of Chicago, was preparing a report to be presented at the convention at Detroit and he suggested that the secretary forward a copy of the resolutions passed at the June meeting of the New York State Association for the committee's information. This has since been done. The resolutions were published in Rock Products.

The standardization committee was then discharged.

George Schaefer then presented his report as secretary, which showed, among other things, the following activities of the Association in 1926.

Secretary Schaefer's Report

Attended the Montreal National Association convention in a body and with the largest local association representation of any state in the Union.

Contributed $6,000 to the National Crushed Stone Association in support of the Bureau of Research and Engineering at Washington.

Procured a number of new active and associate memberships for the National Crushed Stone Association.

Assisted the National Crushed Stone Association in railroad matters before the Interstate Commerce Commission at Washington.

Visited and inspected five stone quarries interchanging ideas for betterment of production methods.

Assisted each other on shipments when it became necessary, so that maximum service could be assured irrespective of with which company the order had been originally placed.

Endeavored to keep in close touch with matters vital to the crushed stone industry, and, insofar as possible to disseminate such information to our membership.

Adopted an emblem which spells honesty, service and responsibility in business dealings and recognition of the rights of others.

Met with state and county officials to promote a better mutual understanding, insure greater production and better quality of material, and to render more adequate service through uniformity of shipments throughout the year and elimination of peak loads in spring and fall.

In the matter of the proposed standardization of screen sizes as suggested by the National Engineering Bureau, went on record and recommended the adoption of a series of sizes such as could be produced through the use of screens having not to exceed a total of five primary sizes of openings.

Started negotiations relative to a fairer interpretation of the rules governing workmen's compensation insurance.

Endeavored through regular personal contact to promote a better feeling among us and to create that pride in our occupation so essential in the conduct of our business dealings.

Mr. Schaefer's report as treasurer was then read and after accepting these reports the meeting gave him a vote of thanks for his work during the year.

Constitution Changes and Elections

A change in the constitution was made by which the dues for active membership were raised to $5 a year and for associate membership to $3 a year.

It was decided to attend the annual convention of the N. C. S. A. in a body and to go in a special car and the secretary was instructed to arrange for this.

After luncheon the meeting was addressed by Mr. Schermerhorn, engineer of bridges and grade crossings of the State Highway Department. A. T. Goldbeck then spoke of the recent trip to the Pacific Coast, which has been quite fully described in recent issues of Rock Products. James Savage gave a re-run of the films shown at the Buffalo meeting and received a vote of thanks for his courtesy. The meeting was then adjourned.

The following officers were chosen for the ensuing year: President, George E. Schaefer, General Crushed Stone Co., Rochester; vice president, E. B. Johnson, Adams and Duford Co., Chaumont; secretary-treasurer, John H. Odenbach, Dolomite Products Co., Rochester.

Mineral Aggregate Producers Meet in Milwaukee

THE Wisconsin Mineral Aggregate Association held its annual meeting in a room in the Plankington Building, Milwaukee, on December 16. It was very well attended, about 90 persons being present, not all of whom registered, however, so that the registration list shows only 68 present.

This annual meeting was somewhat different from those of former years, which have largely confined their activities to the election of officers and the annual banquet. This year, as the secretary, G. F. Daggett, said in his annual report, was a departure from past methods which tried to give the actual production men information that would assist them in their work. Some excellent papers and addresses resulted from this change.

The secretary's report covered the work of the association from April 15, the date when he took up the work. Mr. Daggett is an engineer and able to assist in production as well as marketing problems. In the plants of five companies short time studies succeeded not only in increasing production but in lowering costs. Plant inspection and testing service also had good results. It is the aim of the association to make membership in the association a guarantee of the quality of the product.

Association Makes Good Progress

Four new member companies joined the association in 1926. These were the Madison Washed Sand and Gravel Co., the Piters Sand and Gravel Co., the Waupaca Sand and Gravel Co., and the Wissota Sand and Gravel Co. More companies are expected to become members in 1927.

Progress was made in studying and correlating various city specification with the idea of standardizing them to reduce production problems.

A serious car shortage developed in the early part of October amounting to 2500 cars, which came about through the short summer loading of coal on the Milwaukee docks. Reasonably good service was secured by the association applying to officials of the railroads involved.

The following officers and members of the Executive Board were chosen for the coming year:

President Geo. G. Brew, Waukesha Sand and Gravel Co., Vice President M. W. Deutsche, North Shore Material Co., Secretary Treasurer Edw. E. Gillen, Waukesha Lime and Stone Co.

Members of the Executive Board: R. C. Brown, Sr., Western Lime and Cement Co., C. R. Nutt, Moraine Gravel Co., L. L. Laun, Elkart Sand and Gravel Co. Inc., G. D. Francey, G. D. Francey Stone and Supply Co.

The morning session was closed except to members; the afternoon session was open to all producers and others interested and this session filled the room, The first paper read was that of William E. Phillips, manager belt conveyor department of H. W. Cadwell and Sons Co., (Link Belt Co.) on "Installation and Care of Belt Conveyors." Mr. Phillips is a recognized authority on conveyors and his work on conveyor idlers is well known. He said that the conveyor industry is only 35 years old and that he had been connected with it for about 20 years.

Types of Belt Conveyors

Mr. Phillips paper was full of meat and it is expected that Rock Products will later publish it in full. It contained among other things some tables on the capacity and characteristics of belt conveyors, never before published, which had been worked out from the results obtained in actual practice. His paper dealt especially with conveyors of the modern type with low-friction idlers and troughing rolls since practically all important installations are now of this type. It described the various methods of driving with the advantages of each, the duplex system, which uses a "wear sheet" to obviate wear on the belt, and a number of details all of which are important in assuring the success of the installation and in prolonging the life of the belt.

Plant lubrication was gone into very thoroughly by A. W. Friend, lubricating engineer with the Standard Oil Co., Milwaukee. He began at the beginning, explaining what friction is and how much power it consumes. Prof. Benjamin of the Case School of Applied Science, Cleveland, Ohio, had found that 44.8% of the power consumed in industrial plants was used in overcoming friction. The lowest figure was 14.5% and the highest 80.7% of the total power used. At 3 cents per k. w. h. one horse power wasted costs $69.98 per year of 52 weeks operation, so overcoming friction costs money.

Winter Oil for Crushers Will Save Money

Lubricating crushers in the winter time was treated more fully than some other features and Mr. Friend said that plants could save a lot of money by using a low cold-test oil in the winter. He spoke of one gravel plant in which it was necessary to build fires under the crushers to allow them to start at all, and after they were started the belts kept coming off until the crushers were warmed up by their own friction. All this cost a lot of money for power used, wages wasted in waiting for the plant to start, wear on belts and the like, and this loss might all have been avoided by the use of a low cost-test oil that would not congeal in cold weather.

John T. Donaghey, highway engineer of the Wisconsin State Highway Commission gave a talk on the present state of highway building and the program for 1927. Two years ago, at a banquet given by the association, Mr. Donaghey predicted that in 1926 highway building in Wisconsin, which was then at its lowest ebb, would be restored to normal, and his prediction has been fulfilled. In 1926 the state had had $15,200,000 to spend on highways, $8,800,000 from license fees, $4,860,000 from a gas tax and $1,900,000 from federal aid. In 1927 the amount will be raised by county bonds issued to build main highways. In all there will be about $22,000,000 to spend, in 1927, of which $14,000,000 will be spent on new construction.

State Will Build Many Miles of Road in 1927

About 375 miles of concrete road will be built and 400 miles of full depth gravel roads. Concrete roads now cost about $32,000 a mile and gravel roads $10,000 a mile but it must be remembered that the cost of a gravel road includes all the expense of grading, putting in culberts and guarding all of which is available when a high-type surface is to be laid.

At present the state has 2500 miles of concrete, 6800 miles of gravel and 700 miles of unsurfaced roads, and Mr. Donaghey said he wanted to see those 700 miles surfaced before any more concrete was built. The Wisconsin policy is to give road service to all the state as far as possible, adapting the type of road to the traffic. At present only 8¾% of the state's area, in which 3% of the population lives is farther than 3 miles from a state highway. Many towns are gravelling connecting roads and thus getting the benefit of state highways and this has created a better sentiment in the rural districts toward paying the cost of highways through the gas tax.

Snow removal was a vexed question as the farmers who haul in logs, posts, stave bolts and firewood during the winter months in certain countries do not want the snow removed, as they haul on sleighs. Mr. Donaghey thought the fairest method of paying for removing snow would be that of levying a 1 cent gas tax during the winter months. Then the man who did not want to use his car in winter could not be taxed for snow removal as he would buy no gas, and the man who wanted the snow removed would pay for the work required.

Only 7% of Material from Wayside Pits

Of the material used in highways 950,000 tons came from commercial plans and 65,000 from local pits. This meant that only 7% of local material was now used instead of the 47% that was formerly used. He said that even this 7% might be reduced if the producers had their eyes opened to certain opportunities they had not seen, and he gave a few illustrations to prove his case.

In Western Wisconsin there is little or no gravel and crushed limestone is the principal road building material. In this part of the state 200 miles of stone road had been built which required 2000 to 2500 yd. per mile. Producers in this section should produce regularly and stockpile their output so that they may sell stone to the counties as it is needed. If they do not do this the contractors will set up small plants and produce stone for themselves.

The World's Greatest Crushed Stone Operation

Two sets of moving pictures were shown, one of the J. L. Shiely gravel plant in St. Paul (shown by Mr. Phillips) and one describing the operations of the Michigan Limestone and Chemical Co., at Rogers City, Mich. This is easily the largest stone crushing operation in the world, producing 12,000,000 tons per year or over 10% of the total crushed stone production of the United States. On certain days production has risen to 54,000 tons according to the story told by the film titles, from which the following is taken.

This property contains 13,960 acres and the limestone occurs in exposed deposits so no overburden has to be removed. There are 560 men employed altogether, about 350 in production. Quarrying is by putting down well drill holes 16 ft. back from the face and 20 ft. apart. The rate of drilling is 140 ft. per day. A picture of a shot showed that such use of powder was very effective, the rock being well fragmented. Six steam shovels have been used to load the rock on standard gage 50-ton cars, each shovel handling 5600 tons daily. These are being replaced by 300 to 350 ton electric shovels with 12-ton dippers. Fourteen trains pull in the cars to the mill and these are controlled by a train dispatcher in a tower from which he can see every train in the quarry.

The crusher house and plant pictures were taken two years ago and the audience was told that several changes had been made in the flow sheet since they were taken. It is said that vibratory screens and roll grizzlies have been substituted for the 9 by 26 ft. and 9 by 32 ft. revolving screens shown in the pictures. The crusher house contains 60-in. gyratories and the crushed material after passing the grizzly goes to screens for separating into commercial sizes. All the rock is washed by sprays on the screens and is afterwards passed over a dewatering screen to remove the dirt and the fines. The oversize is crushed with slugger rolls and returned to the screen system.

Many of the pictures were of the ships which transport the material to the steel plants, the principal users of the product, and the docks at Detroit and other points where the stone, other than flux stone, is marketed. These boats are really floating storage bins with a belt in a tunnel below the bins for reclaiming the stone. This belt discharges to an elevator which raises the stone to a belt on a swinging arm that delivers it to the dock.

Aerial pictures of the plant and quarry gave a good idea of the immensity of the operation. The huge stock-piles from which the boats are loaded were prominent in these pictures. The stock piles are built by a conveyor system and the stone is reclaimed by a belt in a tunnel below. The stone is loaded on the boats by shuttle conveyors that move in and out in order to spread the load and trim the boat.

George C. Brew, elected president of the Wisconsin Mineral Aggregate Association

These films were shown through the courtesy of Carl D. Bradley, president of the Michigan Limestone and Chemical Co., and Edward E. Gillen of Milwaukee.

The annual banquet given at the Elk's Club in Milwaukee was a great success. The entertainment provided was rather above the sort usually given at such affairs.

Registration

Those who were present were:

Mrs. Edw. E. Gillen, H. M. Halverson, Leon Jorgenson, John Bralick, Mike Koken, Henry Soat, L. M. Atkinson, F. C. Wolf, E. F. Bremer, Grover C. Goerke, N. K. Wilson, William J. Wagner, Edward A. Toerke, Clarence Wolf, Walter Soat and John Goerke, Waukesha Lime and Stone Co.
C. E. Tufte, M. Flemming and I. M. Clicquennoi, Wisconsin Sand and Gravel Co.
Frank Brew and E. J. Reiten, Waukesha Washed Sand and Gravel Co.
Geo. G. Brew, Waukesha Washed Sand and Gravel Co. and Madison Washed Sand and Gravel Co.
C. R. Nutt and Mrs. A. W. Lee, Moraine Gravel Co. and Waupaca Sand and Gravel Co.
J. W. Peters and A. J. Stock, Peters Sand and Gravel Co.
C. G. Ruedebusch and K. C. Ruedebusch, Mayville White Lime Works.
Theo. E. Fleischer, Sheboygan Lime Works.
T. J. Schott, Wausau Sand and Gravel Co.
E. E. Long, The Western Lime and Cement Co.
J. K. Jensen and W. Poenichen, Janesville Sand and Gravel Co.
Walter B. Snow, Madison Washed Sand and Gravel Co.
L. L. Laun, Elkhart Sand and Gravel Co., Inc.
Charles P. Biesanz, Biesanz Sand and Gravel Co.
G. D. Francey, G. D. Francey Stone and Supply Co.
J. D. Ohrt, Davis Bros. Stone Co.
B. H. Atwood and M. W. Deutsche, North Shore Material Co.
A. J. Blair, Lake Shore Stone Co.
A. J. Strachota, Big Bent Gravel Co.
Frank H. Behringer, Leathem D. Smith Stone Co.
T. J. Vitcenda, J. T. Donaghey (state highway engineer), A. L. Hambrecht and C. R. Weymouth, Wisconsin Highway Commission.
G. H. Mueller, Geo. H. Mueller Co., Koehring Co. and C. H. & E. Mfg. Co.
F. Brandenburg, Koehring Co., C. H. & E. Mfg. Co. and Geo. H. Mueller Co.
C. R. Considine, Williams Patent Crusher and Pulverizer Co.
Erwin F. Cords and Chas. C. Hervey, The Goodyear Tire and Rubber Co., Inc.
A. H. Findeisen, Industrial Commission of Wisconsin.
Mrs. R. T. Springate, Mrs. W. E. Philips, W. E. Philips and R. C. Kendall, Link-Belt Co. Cadwell plant
J. H. Jackson, The W. S. Tyler Co.
J. W. Henderson, F. T. Kern Co. and Smith Engineering Works.
A. W. Friend and L. F. Paape, Standard Oil Co.
Albert E. Reed, The W. S. Tyler Co.
Sam Wood, Cunningham-Ortmayer Co.
Hugo W. Weimer, consulting engineer, Milwaukee.
O. C. Hubbard, Wisconsin Vibrolithic Service Co.
H. C. Norman, Galland-Henning Mfg. Co.
R. A. Goodwin, "Cement, Mill and Quarry."
Edmund Shaw, "Rock Products."

Tension Tests of Concrete

A. N. JOHNSON, dean of the College of Engineering, University of Maryland, has reported in the July issue of *Public Roads* the results of a series of tests on concrete in tension.

The purpose was to obtain more data as to the relative strength of concrete specimens in compression and tension, the tension specimens to have a cross-sectional area equal to those of the compression specimens.

From the results obtained it was concluded "that the ratio of tensile to compressive strength is practically the same for the 1:2 mortar specimens as for the 1:2:3 concrete, and, second, that for specimens up to 90 days old the ratio in each case varies from about 15% to about 8%, and after this period the ratio becomes practically constant at 8%. It is apparent that during the first 60 to 90 days the increase in tensile strength is not as great as the increase in compressive strength, but beyond this time it appears that both are modified in practically the same ratio.

"The agreement of the results seems so persistent, over such a wide variation in the character of the concrete, that there is considerable definite evidence as to the ratio between the tensile strength and compression strength. Thus, in any given case the compression strength being determined, the tensile strength is made known with sufficient accuracy for most purposes.

"During these experiments a few measurements were made to determine the elastic curve of the concrete in tension. It is, perhaps, sufficient here to state a few of the results obtained.

"The deformations obtained upon a 1:2 mortar specimen, which broke at 340 lb. per sq. in., and indicate a modulus of elasticity of 4,200,000 lb. per sq. in. The values of E for the few specimens tested varied from 3,300,000 to over 5,000,000 for some specimens.

"It is the expectation to carry on a more extended series of observations of the modulus of elasticity of concrete in tension, particularly with Lumnite cement."

Indiana Gravel Producers Report Excellent Year

THE Twelfth Annual Convention of the Indiana Sand and Gravel Association was held in Hotel Claypool, Indianapolis, on December 15. The morning session, which began at 10 o'clock and lasted until noon, was closed except to members. There was a business meeting at that session, an address by the president and the regular reports of secretary and treasurer and committees.

These reports showed the association to be in excellent condition. This is also shown by a statement made by S. C. Hadden, executive secretary, which reads:

"Our industry is now very thoroughly organized from one end of the state to the other. Every large producer, with a single exception, is a member of the association, and even in that case, the producer who is outside, cooperates in many of the association activities. In addition to these larger producers, all of those in the intermediate class and many of the smaller ones who wash, screen and grade sand and gravel, belong to the association. We have more members now than ever before in our history, and the relations of the producers are more harmonious than ever before. We feel that we have achieved a financial as well as a general success during the year now coming to a close.

Adhering to Program

"A year ago we drew up a program of activities for the year 1926, and we have adhered very closely to this program and have carried out its various provisions as fully as possible, from week to week. As you know, we favor the free play of economic forces and the preparation of specifications according to approved engineering practice. We are on good terms with all the other basic industries and have earned the respect and confidence of the newspapers of the state, as well as of the general public."

The officers of the association were all re-elected. They are:

President, E. Guy Sutton, Neal Gravel Co., Mattoon, Ill.; vice-president, L. R. Witty, Wabash Sand and Gravel Co., Terre Haute, Ind.; secretary-treasurer, Jesse Shearer, Indiana Gravel Co., Indianapolis.

Directors, J. P. Coyle, Consumers Co., Chicago, Ill.; E. S. Baker, Baker Gravel Co., Noblesville, Ind.; Abe Hart, Sandborn, Ind.

Lime-Gravel, a Promising New Type of Road

The afternoon session was given to addresses and discussions on uses of sand and gravel. One of these was by H. W. Wood of the National Lime Association, who has been conducting experiments on the use of hydrated lime in clayey sub-bases for roads in Indiana. He brought out the somewhat surprising fact that hydrated lime in comparatively small quantity mixed with road gravel showed a remarkable ability to resist rutting and wear from heavy traffic. This was confirmed by Jesse Shearer, who said that he had used hydrated lime on the road to his plant, by simply mixing it with the gravel surfacing, with very good success. Prof. Wiley, of the University of Illinois, spoke of the lime-gravel sections of the test road being built under the direction of the university and said that they "stood up like islands" during the very wet weather of last fall. While the experiments are by no means complete, enough has been done to show that lime-gravel roads are well worth further and more thorough investigation.

E. Guy Sutton, re-elected president of Indiana Association

Mr. Wood said that lime undoubtedly helped to make "all-weather" roads of dirt roads when it was worked into the top six inches of the soil. In gravel roads it prevented the dirt from working up through the surfacing. He spoke of a two-year test just completed in South Dakota which had shown good results. The use of lime with gravel opened a new market for gravel, especially pea gravel, which could be used at the rate of 600 yd. per mile with lime. The entire amount of gravel needed for surfacing may be placed on the roads at once if lime is used (Prof. Wiley later disputed this, however), which saves labor and time in opening the road to heavy traffic.

Jesse Shearer said he surfaced the road to his plant with pea gravel and used one sack of hydrated lime to every 10 ft. of road. It had rained twice since this was done and the road had set up almost like concrete. The gravel was about 2 in. thick.

Prevost Hubbard, chemical engineer of the Asphalt Association, made a talk which dealt principally with the use of gravel as an aggregate in asphalt roads, and which was apparently intended to convince the producers that their interests might lie eventually in promoting bituminous paving. He spoke of the 200,000 miles of gravel road in the country, of which 15% is in Indiana, as the basis of a program of progressive road-building. Properly made and maintained, such roads are adapted to asphalt surfacing when the traffic becomes dense enough to justify it.

Defacement at the sides is one of the difficulties of gravel roads and he advised that such roads be built with a uniform gravel surfacing the full width. If this is done the center strip will make an excellent foundation for an asphalt wearing course.

Annually 120,000,000 square yards of asphalt paving are laid and this requires 1,400,000 tons of asphalt, about the same amount of filler and 600,000 tons of aggregate.

Western Engineers Prefer Gravel Aggregate for Asphalt Roads

Eastern engineers have preferred crushed stone as an aggregate but in the west, especially on the Pacific coast, gravel is the preferred aggregate, especially in "black base" roads which use about as much gravel per inch of thickness as a gravel road. Such roads have been laid in California since 1894 and they are still giving excellent service.

Aggregates for use with asphalt were being intensively studied. It was known that sharp sand would give greater stability than sand with rounded grains but recent investigations had shown that equal stability could be secured with rounded grains if the proper amount of filler was used. It was thought that by combining the right sizes of gravel so as to produce high density and low voids an aggregate mixture could be made that would have very satisfactory stabilizing properties.

In answer to questions, he said that "black base" on the Pacific coast was 4 in. thick with a 2-in. wearing course. It was laid directly on the sub-grade. Similar pavements had been laid in Decatur and Quincy, Ill., and lately had been found very satisfactory in Louisiana.

C. C. Wiley, Assistant Professor of Highway Engineering at the University of Illinois, made the last address of the afternoon. He spoke of the tests on secondary roads that are being carried on in Vermillion county, in which the Indiana Sand and Gravel Association is cooperating by furnishing a part of the material used. One of the

reasons for this was the hope of developing a broader market for pea gravel which Indiana deposits contain in excess of what can be easily sold for concrete aggregate, ballast and like uses.

Prof. Wiley spoke first of some of the difficulties of road tests which were very expensive because they had always to be made on a full-sized scale. Laboratory tests were impossible from the very nature of the thing to be tested. Difficulties often come from the expense involved and the impossibility of getting material as it was needed. Nevertheless, such tests paid well. It could be shown that the Bates road tests, which had cost so much that they had been severely commented upon by certain critics of the Illinois road program, had already repaid their cost to the state from 10 to 20 times, to say nothing of the saving to towns and cities and to other states.

Pea Gravel Found Best for Road Surfacing

The road selected for these secondary road tests was northeast of Danville and was in about as bad condition as a road could be without being absolutely abandoned. Most of the traffic had left it for a longer route on a state highway. One of the most important things which was done to this road was to really grade it, that is, not only to make it in such a way that the surface water would run off but to open ditches that would carry off the surface water so that it could not return to the road. This in itself was a great improvement.

Cars of pea gravel and 1½-in. gravel were secured from the Indiana association and used on different sections. Unquestionably the pea gravel had proved the better surfacing. Sand was also used and the section with pea gravel over sand was good yet after all the extremely wet weather and the heavy traffic it had endured. This section consolidated rapidly. The coarse gravel was nowhere near so good. An excellent way to fill holes was found to be the use of the grader with pea gravel.

Before the gravel sections were really ready for traffic they had to receive a lot of it as repairs on the state highway caused the test road to be used as a detour. Much of the graveling was done while the road received this traffic.

It was found that the road must be wide and *flat* to stand traffic satisfactorily. Rolling only helps to consolidate the surface a little more quickly and probably rolling does not pay. The conclusions regarding pea gravel were the same as those reached in Wisconsin where the best gravel for surfacing was found to be that which passed a ¾-inch screen.

The lime gravel road that had been mentioned had 6 in. of pea gravel for the surface. Seven per cent lime had been found to give the best results. This was commercial lime hydrate poured out of the sacks as the gravel was applied and spread sufficiently to incorporate it with the gravel.

Prof. Wiley also spoke of the advantages of using pea gravel in other road construction, especially of using it on oiled shoulders of the 9-ft. concrete roads, of which there were a few in Illinois. With such shoulders cars were able to drive on and off the concrete center strip quite easily.

George Miller (Granite Sand and Gravel Co., Indianapolis) gave a progress report on the results of the tests made at Purdue University to determine the relative values of gravel and crushed stone as concrete aggregate. The test showed that gravel and crushed stone in Indiana were of the same specific gravity and hence they gave an equal yield of concrete when mixed by weight. The water-cement ratio had been proved by these tests to be dependable as a measure of the strength of concrete. The fineness modulus, however, cannot be relied upon to predetermine concrete strength, at least with the aggregates that were tested.

A great deal of the report had to do with the use of pea gravel in concrete, which is the special local problem of the Indiana producers. The strength was found to be greater with the pea gravel than without and there was a greater yield based on one cubic foot of cement as a unit.

Water-Cement Ratio Specification Will Settle Questions of Aggregate

It was the conclusion of the report that if the water-cement ratio was adapted as a base for concrete specifications all questions regarding aggregate would settle themselves.

V. P. Ahearn spoke for a moment of the National Sand and Gravel Association (of which he is executive secretary) and its coming convention in Cincinnati. He said that Prof. Abrams and other prominent men had promised to be present and also that Stanton Walker's report, as chief of the division of engineering research, would be one of great interest and value to all gravel producers.

Good Highways Keep Down Taxes

Earl Crawford, secretary of the Indiana Highway Association, gave a very good talk on the highways as a great national transport system and said we made a fundamental mistake in trying to keep down taxes by reducing first cost. No other system of transport was called upon to stand the heavy repair and replacement expense that automobiles had to stand. Any man who had run a car knew that for every dollar he paid for actual running expenses he had to pay a dollar for repairs and replacement of the worn out car. The proper solution of the road problem was to spend the money wisely so as to keep down this expense so far as it was possible to do so.

At 6 o'clock a dinner was given to members of the association and guests and in the evening all were invited to a theatre party.

Registration

E. Guy Sutton and H. E. Neal, Neal Gravel Co., Mattoon, Ill.
M. A. Neville and K. R. Misner, Western Indiana Gravel Co., Lafayette, Ind.
Abe Hart, Don R. Hart and D. R. Snyder, Sandborn, Ind.
G. V. Miller, W. K. Miller, C. E. Jefferson and J. H. Jefferson of Granite Sand & Gravel Co., Indianapolis.
Floyd Million and W. F. Million, Million Sand & Gravel Co., Lake Cicott, Ind.
H. C. Huffstetter and A. M. Brown, Brown-Huffstetter Sand Co., Indianapolis.
Eugene D. Foley and C. A. Barrett, Keystone Gravel Co., Indianapolis.
E. S. Baker, Baker Gravel Co., Noblesville, Ind.
P. A. Stewart, Kickapoo Sand & Gravel Co., Peru, Ind.
J. A. Shearer, F. F. Billeter, A. G. Wilson and A. R. Lacey, Indiana Gravel Co., Indianapolis.
J. P. Coyle, Consumers Company, Chicago, Ill.
Howard H. Maxwell, Bruce D. Maxwell, Stewart W. Maxwell and James B. Maxwell, Maxwell Gravel Co., Indianapolis.
H. W. Reiman, Wm. Nading Grain Co., Gravel Division, Shelbyville, Ind.
L. R. Witty and L. F. Hart, Wabash Sand & Gravel Co., Terre Haute, Ind.
C. F. Connelly, Terre Haute Gravel Co., Terre Haute, Ind.
L. D. O'Donnell, O'Donnell Sand & Gravel Co., Vincennes, Ind.
C. W. Stevens, C. W. Stevens Gravel Co., Indianapolis, Ind.
Chas. A. Murphy and Albert Hutchison, Brazil Gravel Co., Brazil, Ind.
C. G. Cooley, Cooley & Fechtman, Indianapolis.
Amos Beam, Grant Sand & Gravel Co., Marion, Ind.
S. C. Hadden, executive secretary, Indianapolis.
V. P. Ahearn, secretary, National Sand and Gravel Association, Washington, D. C.
Edmund Shaw and W. A. Wilson, "Rock Products," Chicago.
Prof. C. C. Wiley, University of Illinois, Urbana, Ill.
H. W. Wood, Jr., engineer, Highway Department, National Lime Association, Washington, D. C.
Prevost Hubbard, chemical engineer, the Asphalt Association, New York, N. Y.
Geo. W. Craig, manager, middlewestern branch, the Asphalt Association, Chicago, Ill.
Earl Crawford, Indiana Highway and Motor Association, Indianapolis.
C. M. Young, Cincinnati Rubber Co., Indianapolis.

Highway Research Summary Bulletin Now Available

THE *Summary Bulletin*, giving the principal findings of the research committees of the Highway Research Board as presented at the sixth annual meeting, has just been issued. Copies have been sent to all those on the mailing list for *Highway Research News*. Others desiring copies may secure them on application.

The purpose of the *Summary Bulletin* is to present in brief form to highway officials and road builders the latest developments in highway research as presented at the annual meetings of the Highway Research Board.

The *Summary Bulletin* is designed to meet the demand of the engineer and the executive for crystallized facts of highway research, presented in such a manner as to make possible their practical application. Those who wish to study more carefully the results of the investigations may refer to the complete proceedings of the annual meetings.

Applications for the complete report of the Proceedings of the Sixth Annual Meeting of the Highway Research Board (available about April 15, 1927) should be addressed to Highway Research Board, National Research Council, Washington, D. C. —*Highway Research News.*

Convention Program of the National Sand and Gravel Association

Everything Ready for the Big Event at Cincinnati

FOLLOWING is the program of the National Sand and Gravel Association's eleventh annual convention which is to be held at Cincinnati, Ohio, January 17, 18 and 19:

Sessions

Sessions of the convention proper will commence promptly at 10 a. m., *eastern standard time*, Tuesday and Wednesday mornings. The afternoon session of the convention will commence promptly at 2 p. m. The annual dinner will be on Tuesday evening at 7 o'clock. The board of directors will convene at luncheon on Monday, January 17. All meetings will be held on the roof garden of the Gibson hotel.

Reduced Passenger Rates

The carriers have granted reduced rates of one and one-half fare for the round trip upon the certificate plan. In purchasing tickets, a certificate should be procured from the ticket agent, indicating that the purchaser is going to Cincinnati to attend the annual convention of the National Sand and Gravel Association.

Monday, January 17

The board of directors will meet Monday noon for routine business in order to conserve the time of the convention proper, and will consider the following:

1. Preparation of plan of activities for the association during the ensuing year, and also a budget to cover such activities, for submission to the convention as a whole for approval.
2. Nomination of candidates for the offices of president, vice-president and secretary-treasurer and also for three directors-at-large.
3. Selection from their own number of four members of the executive committee for the year 1927.

Tuesday Morning, January 18

10:00 Address of Welcome—Hon Murray Seasongood, Mayor of Cincinnati.
10:30 Annual Address of the President—Hugh Haddow, Jr.
10:45 "The Value of Industrial Associations"—G. S. Brown, President Portland Cement Association.
11:15 "Importance of Industrial Research"—D. A. Abrams, Director, Research Laboratory, Portland Cement Association.
11:45 Report of President Haddow Covering Activities of Association's Staff and Committees.

The reports of the president, secretary-treasurer, director of engineering research, executive secretary and of the committees on standardized sizes and standard depreciation scale are printed in pamphlet form for distribution to the members. Discussion of these reports will be led by the authors of each of them.

Tuesday Afternoon

2:00 Report of Board of Directors and Election of Officers. (Note: There will be a luncheon meeting of the newly elected executive committee, together with the retiring members of the committee, at 12:30 o'clock on Wednesday, January 19.)
2:30 "Transportation Problems as Related to the Sand and Gravel Industry"—W. J. McGarry, Manager Open-Top Car Section, American Railway Association.
3:00 "A Better Railroad Ballast"—F. J. Stimson, Chief Engineer, Pennsylvania Railroad.
3:30 "The Value of Sand and Gravel Traffic to the Railroads"—Edwin Brooker, Commerce Counsel.
4:00 "Co-operation of Two Industries"—C. R. Stokes, Manager Highways Bureau, National Lime Association.

The annual dinner will be held in the Gibson ball room at 7 o'clock Tuesday evening. Music for dancing and entertainment will be furnished. Tickets, at $5 each, may be procured at the registration desk on the roof garden of the hotel.

Wednesday Morning, January 19

10:00 "Design of Sand and Gravel Plants"—Frank W. Welch, Chief Engineer, The Greenville Gravel Corporation.
10:30 "Factors Entering Into the Design of Sand and Gravel Washing Plants"—Gordon Smith, Secretary, J. C. Buckbee Co., Engineers.
11:00 "New Developments in Screening Plant Design"—Albert E. Reed, W. S. Tyler Co.
11:30 "Constructing a Gravel Washing Plant for Truck Service"—Fred W. Cornuelle, Red Bank Gravel Co.
12:00 "Methods for Testing Sand and Gravel"—Stanton Walker, Director Engineering and Research Division, National Sand and Gravel Association.

Wednesday Afternoon

2:00 "Taxation for Public Construction"—Judge William A. Hough, Indiana State Tax Commission.
2:30 "Mineral Aggregates for Highway Construction"—A. S. Rea, Engineer of Tests, Ohio Department of Highways and Public Works.
3:00 "Gravel Inspection Methods Used in Michigan"—R. L. Morrison, Director, Michigan State Highway Laboratory.
3:30 "Sand and Gravel in Asphalt Pavement Construction"—Frederick C. Field, Chemist, The Asphalt Association.
4:00 Unfinished Business.
4:30 Adjournment.

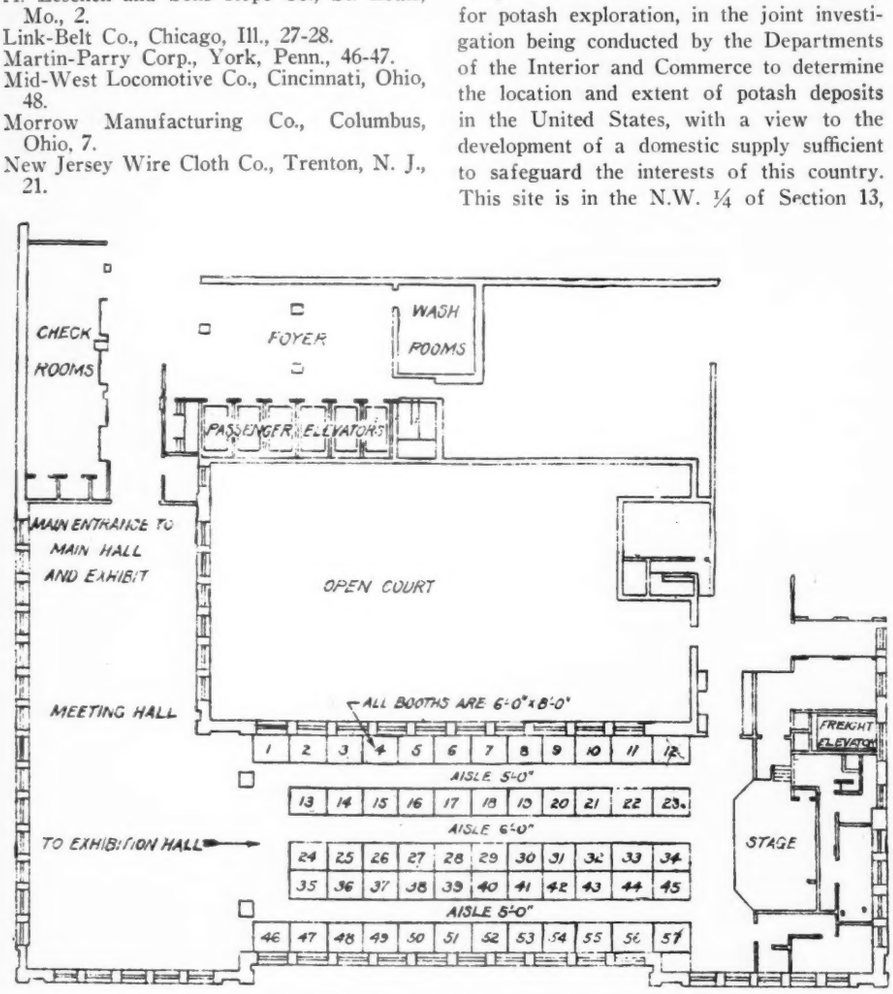
The entertainment committee meets the bunch. (From a pamphlet issued by the convention committee of Ohio producers)

Exhibition

This is the first year that the annual convention will include an exhibition of machinery used in the production and preparation of sand and gravel. The following is a list of exhibitors with the numbers of the booths they will occupy:

Allis-Chalmers Mfg. Co., Milwaukee, Wis., 20.
American Manganese Steel Co., Chicago, Ill., 26-37.
Barber-Greene Co., Aurora, Ill., 34.
R. H. Beaumont Co., Philadelphia, Pa., 32-33-43-44.
Blaw-Knox Co., Pittsburgh, Pa., 24-25.
Brown Hoisting Machinery Co., Cleveland, Ohio, 18.
Cement, Mill and Quarry, Chicago, Ill., 50.
Cincinnati Rubber Manufacturing Co., Cincinnati, Ohio., 49.
Climax Engineering Company, Cleveland, Ohio, 57.
The Dorr Co., New York, N. Y., 36.
Eagle Iron Works, Des Moines, Iowa, 31.
Fairbanks, Morse and Co., Chicago, Ill., 51-52.
Farrell-Cheek Steel Foundry Co., Sandusky, Ohio, 40.
Fate-Root-Heath Co., Plymouth, Ohio, 23.
Gifford-Wood Co., Hudson, N. Y., 11.

Stephens-Adamson Manufacturing Co., Aurora, Ill., 53.
C. Taylor Handman Co., Cincinnati, Ohio, 9-10.
The Hayward Co., New York, N. Y., 15-16.
Hendrick Manufacturing Co., Carbondale, Penn., 25.
A. Leschen and Sons Rope Co., St. Louis, Mo., 2.
Link-Belt Co., Chicago, Ill., 27-28.
Martin-Parry Corp., York, Penn., 46-47.
Mid-West Locomotive Co., Cincinnati, Ohio, 48.
Morrow Manufacturing Co., Columbus, Ohio, 7.
New Jersey Wire Cloth Co., Trenton, N. J., 21.



Plan of floor in Gibson Hotel on which N. S. and G. convention will be held, showing machinery exhibit booths

Niagara Concrete Mixer Co., Buffalo, N. Y., 30.
The Osgood Co., Marion, Ohio, 1.
Perfect Classifier Co., Nashville, Tenn., 6.
Pit and Quarry, Chicago, Ill., 17.
Rock Products, Chicago, Ill., 39.
Sauerman Bros., Inc., Chicago, Ill., 13-14.
Symons Bros. Co., Milwaukee, Wis., 8.
Taylor-Wharton Iron and Steel Co., High Bridge, N. J., 19.
W. S. Tyler Co., Cleveland, Ohio, 3.
Vulcan Iron Works, Wilkes-Barre, Penn., 5.
The Webster Manufacturing Co., Cincinnati, Ohio, 22.
The F. M. Welch Engineering Service, Greenville, Ohio, 4.
G. H. Williams Co., Erie, Penn., 29.

Every sand and gravel producer in the United States is invited to attend the convention, and it will pay any producer, whether his output may be large or small, to be there. The actions of the convention will eventually affect every man in the sand and gravel industry. DON'T FORGET TO GET YOUR CERTIFICATE!

New Mexico Site Designated for Potash Exploration

ANNOUNCEMENT has been made by the Bureau of Mines of a drilling site in southeastern New Mexico, which has been designated as fifth in order of availability for potash exploration, in the joint investigation being conducted by the Departments of the Interior and Commerce to determine the location and extent of potash deposits in the United States, with a view to the development of a domestic supply sufficient to safeguard the interests of this country. This site is in the N.W. ¼ of Section 13, Township 17S, Range 31 E., Eddy County, New Mexico, approximately 35 miles east of Artesia. The exact site of the test may be within the quarter section specified. The site selected is on government land, is at least a mile from any state or privately owned lands, and is thus not affected by the clause of the enabling act which requires that leases must be negotiated by the Bureau of Mines with all owners of land or mineral rights within a radius of one mile of any proposed bore-hole before drilling operations can be commenced.

It is recommended by the Geological Survey that for this test a complete core be taken from top to bottom. This will give valuable information affecting the selection of other possible sites in this region and also bearing on the possible subsequent sinking of a shaft. The top of the potash-bearing salts should be reached at about 850 ft.; the total depth recommended for drilling is 2000 ft., which may possibly be shortened to 1850 ft. or extended to 2300 ft., depending upon the showings of the core at the time of drilling.

In the selection of this site the following factors have been considered: Proximity to an area of favorable showings; potential value of site for future mining; favorable conditions for drilling; accessibility; fuel and water supplies, and possible further investigation of an extended area.

Announcement has previously been made of the designation of four alternative sites in central western Texas, two in Upton County and one each in Crockett and Ector Counties. These four alternative sites, being located on privately owned lands, are affected by the terms of the enabling act requiring the negotiation of leases with all land owners and holders of mineral rights within a one-mile radius.

Utilization of Asbestos Waste

A NEW use has been found for a great quantity of waste material produced at the mines of the Asbestos Corp. of Canada in the Thetford, Que., district.

Experiments are said to have proved that this has value for agricultural purposes, supplying constituents lacking in much of the soil of eastern Canada. While it is not intended at this stage to suggest that this material can be used indiscriminately in agriculture, experiments conducted at Macdonald College and by the Milton Hersey Co. of Montreal show that a distinct effect is produced on certain types of soil by the application of this stone.

Macdonald College has undertaken to make a further investigation and the question is also being studied by the authorities of the Dominion Experimental Farms and by the Provincial Department of Agriculture at Quebec.

The discovery of the value of this material was made by P. C. Armstrong and the investigation brought to its present stage through support given by the development branch of the Canadian Pacific railway. Mr. Armstrong has been retained by the Asbestos Corp. of Canada to make a further study of the possibility of rendering this material available for agricultural use.

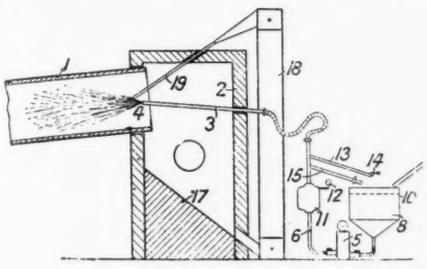
German Macadam Roads

MOST German roads are waterbound macadam, although some engineers prefer block roads of granite or other hard rock, and roads of cement blocks are being tried in central Germany. Seventy-five per cent of the road work is hand work, the stone being broken at the roadside by hand hammers. Labor costs 22 cents per hour. The contractor must do a good job, for he has to keep the road in repair for at least 10 years. In Berlin asphalt roads on 12-in. concrete bases are used. The cost is about $4.05 per square yard. German roads are well described in Circular No. 61 of the U. S. Department of Commerce, from which the above has been taken.

Foreign Abstracts and Patent Review

Porous Artificial Stone. Porous concrete is made by mixing a finely divided intimate mixture of lime and siliceous materials such as calcined slate or shale with water and a gas-generating agent, and hardening the resulting porous mass by steam under pressure. A powdered metal such as zinc or aluminum is preferably used to generate gas, but porosity may be obtained by other means, through the use of soaps or of ice. *British Patent No.* 258,073.

Charging Rotary Cement Kilns. Slurry is fed to the rotary kiln *1,* shown in the accompanying illustration, through an atomizing nozzle *3.* A screen *10* is provided in the slurry tank *8* to prevent the passage of large particles to the nozzle, and means are pro-



Spray for cement slurry

vided for returning to the kiln, as dry dust, any slurry carried out by the waste gases. As shown, the escaping dust collects on the inclined floor *17* of the smoke chamber *2* and is carried by an elevator *18* to a pipe *19* which leads to a point in the kiln, located immediately in front of the nozzle *3.*

The dust may be returned to the kiln with the pulverized fuel for burning, or it may be collected in a trough below the kiln and be recharged through slots in the kiln wall by shovel devices which are fastened to the outside of the kiln. The slurry is pumped from the tank *8* by a pump *5* and delivered to the nozzle *3* by a pipe *6* in which is arranged a pressure-equalizing chamber *11.* This chamber is provided with a gage *12* and valved overflow pipes *13* and *15,* the former being fitted with a safety valve *14* which may be connected to an alarm and also to a relay device which serves to start a pulley for withdrawing the nozzle *3* from the kiln. *British Patent No.* 258,199.

Ciment Fondu Composition. A mixture of bauxite and other materials, such as alumina, iron oxide, silica and titanium dioxide, to which the equivalent proportion of lime has been added, is calcined and fused in an oxidizing atmosphere in a rotary kiln. The mass is allowed to cool and is then ground fine. Resulting cements are said to be quick setting and hardening and have great bonding strength.—*French Patent No.* 607,577.

Refractive Magnesite Composition. Magnesite is calcined to caustic magnesia, hydrated and ground 190-mesh fineness. After briqueting it is sintered at a temperature not exceeding 1700 deg. C. and then crushed and ground. The product is mixed with 5% to 10% of the unsintered magnesia and alumina, starch, tar or similar substances are added and the mass molded into desired blocks. *Austrian Patent No.* 103,718.

Lime Manufacture. Limestone is ground to 40 mesh and heated to about 850 deg. C. in the presence of an oxidizing agent such as oxygen or steam. Rotary electric kilns of the muffle type are desirable calciners. *British Patent No.* 256,687.

Some Problems in Magnesite Chemistry—Amorphous magnesia can be detected in mixtures by the fact that it is seen to be colored red under the microscope when treated with an alcoholic solution of diphenyl carbazide. The white material that separates out at times on the surface of the magnesite brick or tile is lime, which apparently comes from the decomposition of calcium ferrite. Periclase is attacked by a solution of ammonium chloride as well as amorphous magnesia. The content of free magnesia in the brick or tile can be determined in this manner. White burnt crumbly magnesite blocks can be converted into a solid and compact form by burning again in an oxidizing atmosphere.—*Ton Industrie,* 50, 1305-07.

Processing Cement. Molten cement is passed directly into a special chamber where it is mixed with other materials and then subjected to a reducing action. A special rotary kiln is used to melt the cement, the hottest part being located near the outlet. The flame and flow of material may be in the same direction or countercurrent. *German Patent No.* 434,187.

Plastics from Mineralized Fibers and Cement. Fibrous matter, such as sawdust, peat, cellulose pulp, cork, etc., are impregnated with a solution of calcium chloride, magnesium chloride, iron chloride or others and then treated with either one or many alkali or alkaline earth carbonates. The resulting material is then mixed with cement. *British Patent No.* 236,450.

Slag Cements Resistant to Salt Water—Blast furnace slag is mixed with clinker containing a large percentage of alumina and the mixture ground fine. Proportions of the ingredients are maintained at about the ratio used in making blast furnace or iron portland cements. Cements made in this way are said to be more resistant to the action of salt water than pure aluminous cements and, in addition, are cheaper to produce than the latter. *German Patent No.* 421,776.

Hydraulic Cements from Oil Shale and Limestone. Oil shale is mixed with a comparatively large proportion of limestone, lime marl and the like, 30 to 50% being employed for this purpose. No fuel is added and the mixture is burnt or heated in suitable apparatus. The residue consists of a hydraulic cement; the various oils and other volatile distillation products are collected and treated further. The burnt residue obtained at the outset is also moistened with the ammoniacal liquors that are recovered in the course of the distillation process and this serves to improve the quality of the cement and at the same time allows ammonia to be evolved and recovered. *German Patents Nos.* 427,801 and 429,651.

Standards for Burnt Magnesia. The following tabulation gives properties of magnesia and the proposed specifications:

		Commercial Magnesia From Magnesite	Precipitated Magnesia	Commercially pure Magnesia
1.	Color	.....	White; inferior qualities yellowish or light gray	Pure white
2.	Solubility in HCl	.....	Perfect	Perfect
3.	Minim'm purity	92.0%	96.5%	97.8%
	Maximum contents of			
4.	Moisture	2.0%	2.0%	2.0%
5.	Lime (CaO)	.....	0.1%	Trace
6.	Foreign metals	.....	0.1%	Trace
7.	Sulphuric acid	.....	.....	Trace
8.	Chlorine	.....	.....	Trace
9.	Carbon dioxide	2.0%	1.0%	0.1%
10.	Substances soluble in water	.....	0.3%	0.05%

—*Continental Metallurgical and Chemical Engineering,* Sept. (1926), 61.

Improving Properties of Hydraulic Cement. The raw cement materials are ground finer than usual and calcined at lower temperatures than customary. The calcining period may also be lessened or both time and temperature of calcination be diminished simultaneously if desired. Fine grinding may be carried on either before or after calcination. Investigations have proven that finer grinding of raw cement materials permits the use of lower calcining temperatures and results in materially lessening the time of calcination and yields a better cement. *German Patent Application No.* 73,577.

Aluminous Cements. A mixture of about 75% bauxite and 25% limestone or lime hydrate is calcined in a usual type of rotary kiln at a temperature between 900 and 1100 deg. C. for a period of from 8 to 12 hours. The mass is then cooled and ground. Cements made in this way are said to have a hydraulic modulus of more than 2. *French Patent No.* 608,162.

Investigation of the Hydraulic Compounds in Iron and Aluminous Cements. The hydraulic compounds in these types of cements, according to a recent theory, are complex compounds of silica and lime in which the several atoms of silicon are bound together in the same molecule. The investigation carried out tends to disprove the existence of tricalcium silicate. The aluminum of the aluminum silicates reacts during

clinkering to give rise to combinations of complex compounds of alumina, silica and lime.

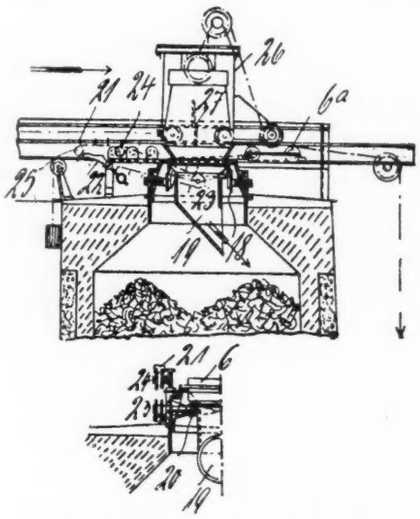
Hydraulic properties of cements are said to be due to lime. Hydrated lime unites the cement ingredients, but is not a hydraulic bond because of its solubility. The hydraulic bonds consist of the insoluble or slightly soluble calcium combinations which are capable of hydrating or hydrolizing, and include certain silicates, the aluminates, some ferrites and titanites. For the manufacture of cements of these types, bauxite ores are generally used, and also residual sludges from plants using alumina and pyrites ash. Calcination is carried out at temperatures ranging from 1000 to 1400 deg. C.; high iron contents using the lower temperatures.—*Mon. Sci.* **16,** 97.

Manufacture of Fused Cement. A mixture of raw cement materials is sintered in a refractory lined rotary kiln and the sintered mass fused on leaving the furnace. For this purpose the metal wall of the furnace or kiln in the region of the outlet is enlarged in the form of a disc and connected with one pole of a source of current of low tension and high intensity. The disc is set obliquely and can be adjusted by means of a hinge and spring with respect to a metal or graphite plate which is connected with the other pole of the source of current. The sintered mass falls between the disc and the plate, closing the circuit, and is fused by the high heat created from the resulting short circuit. *French Patent No.* 604,916.

Effect of Composition of Fuel Ash on Quality of Cement. Recent investigation has shown that the fusibility of fuel ash has an important bearing on the quality of cement made in rotary kilns and also on their efficient operation. Accurate analysis of the ash gives information on its behavior and allows the kiln operator to add composite fuels which prevent the sticking of the ash to the sides of the kiln and thus prevent the formation of rings. *Tonindustrie-Zeitung* (1925), **50,** 81-82.

Plastic Colored Cement Compositions. Cement and substances containing water of crystallization are mixed and subjected to heat and pressure in a mold. After hydration of the cement the plaster material formed is heated to a higher temperature, either in or out of the mold. Fillers such as stearin, wax, bitumens and coloring matter may be introduced in the first stage of the process, before the initial heating. A typical example is given as follows: Eight parts of powdered bitumen, 8 parts of borax and 40 parts of Keene's cement are intimately mixed and then pressed in a mold at a temperature of 100 deg. C., after which heating is continued to a temperature of 150 to 200 deg. C. The method allows the use of other crystallized substances such as alkaline silicates solidified with soap or stearin and the precipitate resulting from action of alum on ammonium carbonate. *British Patent No.* 258,320.

Mechanical Loading Device for Shaft Kilns. The swinging distributor *19* is located in an arrangement that is built into the top of the shaft kiln. This distributor is supported on a number of rollers *18* which are driven by the gear wheel *20*. The latter is driven by an intermediate gear and chain *22*, passing over the sprocket wheels *23*, *24* and *25*. The charging cart *26* moves from the left in the direction of the arrow and trips a lever arm *27* against the chain *21*



Distributing device for shaft kilns

so that this takes up the movement of this cart over the opening in the charging device and as the material falls from the cart into the loading device the chain sets the distributor into motion, so that the material, entering the shaft kiln, is distributed evenly from one side to the other. *German Patent Application No.* 32,847.

Mineralogy of Aluminous Cement. The mineralogical constitution of the aluminous cement clinker is shown to consist in most cases of gehlenite, monocalcium aluminate and, in part, of tricalcium pentaaluminate. Inasmuch as the mineralogical calculations which are made from the results obtained in analyzing the clinker, which in certain cases at least lead to the conclusion that the ratio in monocalcium aluminate between alumina and lime is 1:1.05-1.1, it would appear correct to say that the monocalcium aluminate or other mineral matters entering into the composition of the aluminous cement clinker contain a little lime in the state of a solid solution. Monocalcium aluminate, from the mineralogical standpoint, belongs to the rhombic crystalline family, characteristic of compounds of the type $RO \cdot R_2O_3$, just like the mineral which is found in nature and which is known as chrysoberyl.

On examination of the pure monocalcium aluminate which is prepared synthetically, it is found that the angle of the optical axes has a value which is entirely different from that of the mineral which is found in the aluminous cement clinker, that is 2V is equal to zero. On the other hand, the other optical characteristics of the synthetic and the natural product agree with one another.

The fact that monocalcium aluminate, which is made by the fusion of the oxides of calcium and aluminum, has only a single axis is a subject of study which has been discussed at length. But the monocalcium aluminate which was made by Rankin and Wright, has, it appears, an axis angle which is equal to $2V = 36 \pm 4$ deg., while the mineral in silicate cement clinker has a greater angle ($2V = 56$ deg.). Hence this angle is subject to considerable variation and there is no definite value that can be assigned to it. *Zement* (1926), **15,** 336-338.

Aluminous Cement. An aluminous cement clinker which on slow cooling spontoneously disintegrates contains at least 25% of alumina and has a silica content of between 0.4 and 0.5 of the alumina content, while the lime content is from three to three and one-quarter times the silica content. White bauxite and pure limestone may be used as raw materials for production of a white cement. *British Patent No.* 259,203.

Recent Process Patents

The following brief abstricts are of current process patents issued by the U. S. Patent Office, Washington, D. C. Complete copies may be obtained by sending 10c to the Superintendent of Documents, Government Printing Office, Washington, for each patent desired.

Phosphoric Acid Manufacture. Fine ground calcium phosphate is subjected to the action of sulphur dioxide under pressure and in the presence of water. The amount of sulphur dioxide used is in excess of that required to form sulphurous acid with the water present. *Henry Blumenberg, Jr. U. S. Patent No.* 1,609,239.

Plaster Board. The inner surfaces of the covering material are treated with a liquid composition of gum arabic and sulphate and then stucco plaster in a wet state is introduced between the covering sheets. *F. J. Griswold. U. S. Patent No.* 1,608,501.

Improving Cement Kiln Operation. Fuel is supplied to a rotary cement kiln in proportions substantially fixed in regard to the particular mix being calcined and equivalent to about 2800 B.t.u. per pound of cement clinker (when burned with air) produced from dry mixes. The air inlets and outlets are restricted so that the oxygen (from the air) is supplied to the fuel in about the actual theoretical amounts required. *John W. Hornsbey, U. S. Patent No.* 1,606,125.

Artificial Soapstone. An artificial soapstone of high tensile strength and low absorption comprising an admixture of soapstone and a cement of high alumina content. *F. Wynkoop, U. S. Patent No.* 1,606,491.

Neutral Refractory Cement. A refractory composition comprising an intimate mixture of a powdered aluminum oxide and powdered sodium silicate. *W. F. Rochow, U. S. Patent No.* 1,606,481.

Production of Phosphorus Pentoxide. A blast furnace is charged with calcium phosphate, silica, coke and an alkali chloride to form the desired phosphorus pentoxide. *C. E. Parsons, U. S. Patent No.* 1,606,319.

Tentative Program, National Crushed Stone Association 1927 Convention

Every Phase of the Industry To Be Discussed by Men Who Know It

THE following program is only in tentative form and subject to possible substitution later:

MONDAY, JANUARY 17, 1927
MORNING SESSION, 10:00 A. M.
Otho M. Graves, Presiding.

10:00 Address of Welcome by Hon. John Smith, Mayor of Detroit.
10:15 Response for the Association and Presidential Address — Otho M. Graves.
11:00 Appointment of Convention Committees.
Rules and Procedure.
Resolutions.
Nominating.
Auditing.
Entertainment.
Reception.
Publicity.
11:15 Reports of Directors on Business Conditions in 1926 and the Outlook for 1927.
12:45 to 2:00 P. M. Get-Together Luncheon. Everyone, including active and associate members, as well as guests, is cordially and earnestly invited to attend.
Luncheon Address—"Ideals in Trade Associations"—John N. Van der Vries, Manager Northern Central Division, U. S. Chamber of Commerce.

MONDAY, JANUARY 17, 1927
Afternoon Session

2:30 "Progress of Bureau of Engineering"—A. T. Goldbeck, Director.
3:00 "Crushed Stone for Sewage Disposal and Water Purification Work"—William E. Stanley, Pearse, Greeley and Hansen, Chicago, Ill.
3:30 "The Use of Crushed Stone in Intermediate Type of Road Construction"—C. N. Conner, Chairman, Low Cost Improved Road Investigation, Highway Research Board.
4:00 General Business.

MONDAY EVENING, 7:30 P. M.
Opening of Manufacturers' Division Exposition of Quarry Equipment and Machinery.
9:30 Smoker and Entertainment.

TUESDAY, JANUARY 18, 1927
Morning Session

10:00 "Agstone Situation in Illinois"—J. R. Bent, Farm Supply Department, Illinois Agricultural Association.
10:30 "The Super Highway and Its Part in Detroit's Master Plan"—Col. Sidney D. Walden, Chairman, Detroit Rapid Transit Commission.
11:00 "Bituminous Road Construction"—R. W. Coburn, Construction Engineer, Department of Public Works, Boston, Mass.
11:30 "Some Modern Developments in Bituminous Road Construction and Maintenance" — K. E. McConnaughay, Hayes Construction Co.
12:00 Discussion by George E. Martin, Consulting Engineer, The Barrett Co.
12:20 "Bituminous Macadam Construction"—G. H. Henderson, Chief Engineer, State Board of Public Roads, Providence, R. I.
12:50 General Business.

TUESDAY, JANUARY 18, 1927
Afternoon Session

1:00 to 2:00 Luncheon for Operating Men, Superintendents and Manufacturers, followed by joint meeting of these groups, inspection of exposition and subsequent sight-seeing trip through the city.
Luncheon for Salesmen, with subsequent meeting, Harry H. Brandon, presiding.
Talks on "Sales," by Charles Henry Mackintosh.
Luncheon National Agstone Association, with subsequent meeting, L. E. Poorman, president, presiding.
Address by Dr. Herbert F. Kriege.
(Programs for the Sales Group Meeting and for the National Agstone Association Meeting have not as yet been completed.)

TUESDAY, JANUARY 18, 1927
Evening

Theater Party.

WEDNESDAY, JANUARY 19, 1927
Morning Session

10:00 "Stone Dust, Its Use and Preparation"—W. M. Weigel, Mineral Technologist, Missouri Pacific Railroad.
10:30 Address by Charles M. Upham, Business Director, American Road Builders' Association.
11:00 "The Value of a Transport Survey"—G. F. Schlesinger, Director of Highways and Public Works, Columbus, Ohio.
11:30 "Michigan Roads"—Frank F. Rogers, State Highway Commissioner, Michigan State Highway Department.
12:00 "The Use of Crushed Stone in the Manufacture of Concrete Products"—W. D. M. Allan, Portland Cement Association.
12:30 "Commercial Sizes of Broken Stone"—F. H. Jackson, Engineer of Tests, Bureau of Public Roads, Washington, D. C.

WEDNESDAY, JANUARY 19, 1927
Afternoon

1:00 to 2:00 Group Luncheons.
Highway.
Salesmen.
Superintendents.
Agricultural Limestone.
Concrete Aggregate and Ballast.
Manufacturers' Division.
2:00 to 5:30 Inspection trip Ford automobile plant for everyone.

WEDNESDAY EVENING, 7:00 P. M.
Annual Banquet.
Toastmaster—(Not determined.)
Speakers—A. J. Brousseau, President, Mack Trucks, Inc.; Frank T. Sheets, Chief Highway Engineer, Division of Highways, Illinois.
(Two other speakers not as yet determined.)

THURSDAY, JANUARY 20, 1927
Morning Session

10:00 "Winter Storage of Stone"—W. R. Sanborn, Lehigh Stone Co.
10:15 Address on Safety Work—Speaker not yet determined.
10:45 Address by W. J. McGarry, Car Service Division, American Railway Association.
11:15 "Installation of Laboratory of France Stone Co., Its Purpose and Program"—A. C. Avril, Mining Engineer, France Stone Co.
11:30 "Field Testing of Concrete for Concrete Roads"—H. F. Clemmer, Wing and Evans, Inc.
12:00 Report of Committee on Welfare and Safety, N. S. Greensfelder, Chairman.
12:15 "Research as an Aid to Safety and Efficiency"—Dr. Oliver Bowles, Superintendent U. S. Bureau of Mine Experiment Station, New Brunswick, N. J.
D. C. Souder, The France Stone Co.
E. E. Evans, The Whitehouse Stone Co.
12:30 Report of Committee on Rules and Procedure.
Report of Auditing Committee.
Report of Resolutions Committee.
Report of Committee on Nominations.
12:50 Installation of Officers for 1927.
1:00 Adjournment.
1:00 General Get-Together Luncheon.

THURSDAY, JANUARY 20, 1927
Afternoon

2:30 Meeting Board of Directors and Officers N. C. S. A.
2:30 Meeting Manufacturers' Division.

N. C. S. A. 1926 Convention Proceedings Available

THE complete proceedings of the ninth annual convention of the National Stone Association have been published in book form and are now available to all members of the association. There are a limited number of extra copies for sale to non-members or other interested parties. Applications should be made to J. R. Boyd, secretary, 651 Earle Building, Washington, D. C.

Traffic and Transportation

EDWIN BROOKER, Consulting Transportation and Traffic Expert
Munsey Building, Washington, D. C.

Proposed Changes in Rates

THE following are the latest proposed changes in freight rates up to the week beginning December 20:

CENTRAL FREIGHT ASSOCIATION DOCKET

14594. **Crushed stone** and screenings, carloads, Hillsville, Shaw Junction and Walford, Penn., to Simon, O., and Jamestown, Penn. Present rate, 105c per 2000 lb.; proposed, 90c per 2000 lb. Route—Via P. & L. E. R. R. and N. Y. C. R. R.

14595. **Sand, blast,** core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica, carloads, Meadville (B. & L. E. R. R.), Penn., to points in New York. Present and proposed rates:

To	Prop. Rates In cents per 2000 lb.	Pres. Rates In cents per 100 lb.
Buffalo	140	17
Black Rock	140	17
Depew	151	17
East Buffalo	140	17
Harriet	164	17
Lancaster	151	17
Niagara Falls	176	17
North Tonawanda	176	17
Suspension Bridge	176	17

14596. **Sand and gravel,** carloads, St. Albans and Forks of Coal, W. Va., to New York Central R. R. stations (O. C. Lines), via Charleston, W. Va. Proposed rates—As shown in Exhibit "A."

EXHIBIT A

*Sand and Gravel, carloads (rates in cents perton of 2000 lb.)

	From	
To W. Va. points	St. Albans, W. Va. Prop. rates	Forks of Coal, W. Va. Prop. rates
Snow Hill	88	99
Dana	88	116
Malden	88	116
Belle	99	116
Witcher	99	116
Dickinson	99	116
Shrewsbury	99	116
Monarch	99	116
Cedar Grove	99	116
Glasgow	116	116
Hugheston	116	116
London	116	116
Cannelton	116	116
Smithers	116	116
Carbondale	116	116
Longacre	116	116
Harewood	116	116
Boomer	116	116
Sattes	99	116
Lock Seven	99	116
Nitro	99	116

*Not subject to rule for constructing combination rates.

14597. **Sand** (except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica) and gravel, carloads, Irving, N. Y., to New York and Pennsylvania. Present and proposed rates, in cents per ton of 2000 lb.:

To	Proposed Inter-state	Proposed State	Present Inter-state	Present State
Erie, Penn.	80	....	113	....
Harbor Creek, Penn.	80	....	113	....
North East, Penn.	80	....	101	....
State Line, N. Y. (Chautauqua County)	80	80	101	80
Ripley, N. Y.	80	80	101	80
Forsyth, N. Y.	80	80	101	80
Westfield, N. Y.	70	70	88	70
Portland, N. Y.	80	70	88	70
Brocton, N. Y.	80	70	88	70
Dunkirk, N. Y.	76	50	76	60
Silver Creek, N. Y.	76	50	76	60

The provisions of Agent Jones' Combination Tariff 288 will not apply in connection with proposed rates.

14621. **Sand,** viz., blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding and silica, Overpeck, O., to Cambridge City, Ind. Present rate, 189c per net ton; proposed, 150c per net ton.

14622. **Sand,** viz., blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding and silica, carloads, Centreton and Campbells, Ind., to Indianapolis, Ind. Present rate, 88c per net ton; proposed, 76c per net ton.

14623. **Gravel** and sand other than blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica, carloads, from various points in Pennsylvania to Marianna and Latrobe, Penn. Present and proposed rates:

From	To Marianna Pres.	To Marianna Prop.	To Latrobe Pres.	To Latrobe Prop.
Ambridge	125	140(1)	125	135(3)
Baden	125	140(1)	125	135(3)
Freedom	125	140(1)	125	135(3)
Rochester	125	15(2)	125	17(2)

Proposed rates in cents per ton of 2000 lb.
(1)—Rates in cents per ton of 2000 lb.
(2)—Rates in cents per 100 lb.
(3)—Rates in cents per ton of 2000 lb.

14624. **Crushed stone,** Melvin, O., to Cornelia, O. Present rate, 15c; proposed, 100c per net ton.

14636. **Lime,** Woodville, Gibsonburg, Maple Grove and Tiffin, O., to Sheffield, Wilcox and Brockway, Penn. Present rate, 21½c; proposed, 17c.

14650. **Sand** (other than blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica) or gravel, carloads, Winona Lake, Ind., to points on the Chicago & Erie R. R. Co. as shown below. Route—Via Winona R. R., Akron, Ind. Present rates, 6th class. To Indiana points:

	Prop.		Prop.
Hammond	80	Leiters	80
Saxony	80	Pershing	80
Highlands	80	Rochester	80
Griffith	80	Athens	80
Crown Point	80	Diske	80
Winfield	80	Laketon	80
Palmer	80	Bolivar	80
Hurlburt	80	Servia	88
Boone Grove	80	Bippus	88
Kouts	80	Huntington	88
Clancarde	80	Markle	90
Wilders	80	Uniondale	90
Lomax	80	Kingsland	90
North Judson	80	Tocsin	95
Aldine	80	Magley	95
Bass Lake Jct.	80	Preble	95
Ora	80	Decatur	95
Monterey	80		

14657. **Sand** (except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica) and gravel, carloads, West Ellwood Junction, Penn., to Butler and Mars, Penn. Proposed rate, 90c per net ton.

Sand, blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding and silica, carloads, West Ellwood Junction, Penn., to Butler and Mars, Penn. Proposed rates, 101c per net ton.

Present rate, 105c per net ton (applies on all kinds of sand and gravel, carloads).

14672. **Gravel and sand** (other than bank, glass, molding, silica, blast, core, engine, filtering, fire or furnace, foundry, grinding or polishing or loam sand), carloads, Wolcottville, Ind., to Cary, Ind. Present rate, 75c per net ton; proposed, 70c per net ton.

14681. To establish following rates on **sand,** carloads, from Muscatine, Iowa, to points in C. F. A. territory listed below:

To	In cents per net ton. Present	Proposed
Benton Harbor, Mich.	252	240
Lancaster, Ohio	378	353
Penn, Mich.	*265	*277
Pullman, Mich.	*265	*277
Midland, Mich.	353	352
Battle Creek, Mich.	.....	328
Bluestone, Ky.	.....	423
Farmers, Ky.	.....	423
Fort Wayne, Ind.	.....	303
Freestone, Ky.	.....	423
Kalamazoo, Mich.	.....	328
La Porte, Ind.	.....	290
Muskegon, Mich.	.....	328
Niagara Falls, Ont.	.....	†398
South Bend, Ind.	.....	290
Thorold, Ont.	.....	†398
Van Antwerp, Ky.	.....	423

†Applies on silica sand only.
*Minimum weight 90% of marked capacity of car, but not less than 60,000 lb.

Except as noted above, minimum weight 90% of marked capacity of car, except when car is loaded to full cubical or visible capacity, actual weight will apply.

14684. **Silica,** carloads, from Alton and East St. Louis, Ill., also Hannibal and St. Louis, Mo., to points east of the western termini of eastern trunk lines in connection with commodity rates published in Item 5085 of C. F. A.-T. B. Tariff 218-D. Present minimum weight, 60,000 lb; proposed, 40,000 lb.

14667. **Stone,** crushed, in open cars, carloads, Centerville, Ohio, to Westerville, Ohio. Present rate, 150c per net ton; proposed, 100c per net ton.

14668. **Gravel** and sand, except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica, carloads, Lafayette, Ind., to Bradley, Ill. (Ill. Cent. R. R.) Present rate, 88c per net ton; proposed, 76c per net ton.

SOUTHERN FREIGHT ASSOCIATION DOCKET

30727. **Gravel and sand,** from Golden, Miss., to Carbon Hill, Ala. Combination now applies. Proposed rate on gravel and sand, minimum weight 90% of marked capacity of car, except when cars are loaded to their visible capacity, in which case the actual weight shall apply, carloads, from Golden, Miss., to Carbon Hill, Ala., 125c per net ton.

30766. **Crushed stone,** from Smyth, N. C., to Tarboro, N. C. Lowest combination applies. Proposed rate on crushed stone, coated with oil and/or asphaltum, carloads, minimum weight 80,000 lb., except when for carriers' convenience car of less capacity is furnished, in which event marked capacity of car, but not less than actual weight, will govern (in such instances, bills of lading and waybills should carry certificate over agent's signature, "Car of greater capacity not available"), but in no case less than 50,000 lb. The minimum weight will be charged for on each car when the actual amount loaded is less—from Smyth, N. C., to Tarboro, N. C., which reflects the present rate from Smyth to Selma, N. C., plus proportion of 175c beyond. The proposed rate is 434c per net ton.

30768. **Granite or stone,** crushed or rubble, from Columbia, S. C., to Georgia R. R. stations. Lowest combination now applies. It is proposed to establish rates on granite or stone, crushed or rubble, carloads, minimum weight 90% of marked capacity of car, except when cars are loaded to visible capacity actual weight will govern, from Columbia, S. C., to Georgia R. R. stations, based on the proposed Georgia joint line scale, less 10%.

30769. **Stone,** crushed, from Isbell and Rockwood, Ala., to Ensley, Ala. The present rate of 4c per 100 lb. on crushed stone, carloads, from Isbell and Rockwood, Ala., to Ensley, Ala., when originally established, applied only via Southern Ry. Shipments to plants at Ensley are now delivered by the Birmingham Southern R. R., and it is proposed to revise the present rate to basis of 4c per 100 lb., plus Birmingham Southern R. R. switching charge.

30862. **Gravel** from Nashville, Tenn., to Columbia, Tenn. Present rate, 5c; proposed rate on gravel, carloads, minimum weight 90% of marked capacity of car, except when cars are loaded to their visible capacity, actual weight shall govern, from Nashville to Columbia, Tenn., 4½c per 100 lb., same as current rate on sand, carloads.

30870. **Crushed stone** from Clermont, Ga., to Smith, Pinetta, Hanson, Calhoun and Madison, Fla. Lowest combination now applies. Proposed rate on stone, crushed, carloads, minimum weight 90% of marked capacity of car, except when cars are loaded to their visible capacity, actual weight will govern, from Clermont, Ga., to above destinations, 224c per net ton, made on basis of the proposed Georgia joint line scale, reduced 10%, for application over trunk lines and short lines.

30893. **Sand** from Spruce Pine, Ala., to Lyle, Tenn. In lieu of lowest combination, it is proposed to establish rate of $1.67 per net ton on sand, carloads, minimum weight 90% of marked capacity of car, except that when cars are loaded to their visible capacity actual weight will govern, from Spruce Pine, Ala., to Lyle, Tenn., made on basis of the proposed Georgia joint line scale.

30908. **Stone** from Whitestone, Ga., to Mt. Savage, Md. Combination rates apply at present. It is proposed to establish rate of 4.62c per ton 2000 lb. on stone, crushed, and powdered whitestone, carloads, minimum weight 60,000 lb., from Whitestone, Ga., to Mt. Savage, Md., made the same as in effect to Baltimore, Md.

SOUTHWESTERN FREIGHT BUREAU DOCKET

10552. **Lime,** from points in Missouri to Iron Mountain, Mich. To establish a rate of 27c per 100 lb. on lime, carloads, minimum weight 30,000 lb., from Mosher and Ste. Genevieve, Mo., to Iron Mountain, Mich. The rate on lime from Mitchell, Ind., group to Iron Mountain, Mich., is 25c per 100 lb. Rate on lime from Mosher and Ste. Genevieve, Mo., to Wisconsin points was made a differential 2c over Indiana, which is the basis proposed above.

10583. **Lime,** from points in Missouri to points in Mississippi and Alabama. To establish rate of 26½c per 100 lb. to Brookhaven and Hattiesburg, Miss.: 25½c per 100 lb. to Jackson, Newton and Meridan, Miss., and 27½c per 100 lb. to Gulfport and Bay St. Louis, Miss., and Mobile, Ala., on lime, carloads, minimum weight 30,000 lb., from Ash Grove and Springfield, Mo. The proposed rates are based on the combination on Memphis using St. L.-S. F. Ry. Tariff 69-K to Memphis and Speiden's 131-E beyond using Jones' Tariff 228 in connection therewith. The rate from Ash Grove and Springfield to Memphis in St. L.-S. F. Tariff 69-K is not subject to Jones combination, while the rate between the same points in other lines' tariffs is subject thereto and shippers on the St. L.-S. F. Ry. are asking for like rates.

10584. **Lime,** from points in Arkansas to points in Missouri, Kansas and Oklahoma. To establish rates on lime, carloads, minimum weight 30,000 lb., from Limedale Spur and Ruddells, Ark., to Missouri, Kansas and Oklahoma points on St. L.-S. F. Ry.

At the present time there are no commodity rates on lime for Limedale Spur and Ruddells to points on the St. L.-S. F. Ry. in Kansas and Missouri. To points in Oklahoma, rates were recently established on basis of 1½c over Springfield, except that where rates from Johnsons, Ark., were higher, the Johnsons, Ark., rates were published. The rates proposed are on basis of 1½c over Springfield, except to points in eastern Kansas and western Missouri, it will be necessary to publish rates on a higher basis, in order to take care of the Fourth Section.

10621. **Lime,** from points in Arkansas to points in Iowa and Minnesota. To establish rate of 19c per 100 lb. on lime, carloads, minimum weight 30,000 lb., from Limedale Spur and Ruddels, Ark., to C. G. W. R. R. stations Westgate to Bailey, Index 7435 to 8490, inclusive, Toapi, Minn., to Randolph, Minn., Index 7495 to 7575, inclusive, Hampton, Minn., to Minneapolis, Minn., Index 7580 to 7620, inclusive, C. R. I. & P. R. R. Stations Manly to Northwood, Iowa, Index 10215 to 10225, inclusive, Gordensville, Minn., to Faribault, Minn., Index 10230 to 10290, inclusive, Comus, Minn., to Minneapolis, Minn., Index 10295 to 10355, inclusive, Mason City, Flint, Hurley, Sheffield and Capin, Iowa.

Note—Index numbers referred to are as provided in Missouri Pacific Tariff 3875-H. The present rate, it is stated, which applies on minimum weight of 30,000 lb., does not permit the Limedale Spur and Ruddels, Ark., interests to place lime at these points on basis of 50,000 lb. minimum, in competition with the rates as in effect from the Springfield district and from Johnsons, Ark.

WESTERN TRUNK LINE DOCKET

5502B. **Stone, crushed,** carloads, from Rock Crusher Siding, Mo. (Gallatin, Mo.) (rates per net ton) to Iowa points:

	Pres.	Prop.		Pres.	Prop.
Blanchard	$1.22	$1.10	Strahan	1.34	1.25
Coin	1.22	1.10	White Cloud	1.34	1.25
Bingham	1.34	1.15	Malvern	1.34	1.25
Shenandoah	1.34	1.15	Silver City	1.34	1.25
Summit	1.34	1.20	Mineola	1.34	1.25
Imogene	1.34	1.20	Coun. Bluffs	1.34	1.25
Solomon	1.34	1.25			

Minimum weight, marked capacity of car, except where cars are loaded to full visible carrying capacity, in which event actual weight will govern, but not less than 40,000 lb.

853-E. **Stone,** crushed (including broken soapstone), from Milladore, Wis., to Joliet, Ill. Present rate, combination as made over junction through which traffic is routed; proposed, $1.85 per net ton. Minimum weight 90% of marked capacity of car, except when loaded to full cubical or visible capacity, actual weight will apply.

3234-C. **Sand,** carloads, minimum weight 90% of marked capacity of car, except that when shipment loaded to full visible capacity is less than 90% of marked capacity of car, the actual weight will apply, subject to minimum of 60,000 lb., from Kansas City, Mo., to Wichita, Kan. Present, 18½c per 100 lb., Class "E"; proposed, 9c per 100 lb.

5842 (Reissued). **Stone,** crushed, carloads, minimum weight 90% of marked capacity of car, but not less than 50,000 lb., from Faribault, Minn., to Roland, Iowa. Present, 14½c per 100 lb. proposed, 8½c per 100 lb.

2051-X. **Stone,** crushed, carloads, minimum weight 90% of marked capacity of car, except when loaded to full visible capacity, but not less than 50,000 lb., from Jasper, Quartzite and Pipestone, Minn., and Sioux Falls, S. D., to Grinnell, Iowa. Present, 11c per 100 lb.; proposed, 9c per 100 lb.

14388. (A) **Lime,** building and (B) lime, agricultural, carloads, minimum weight 30,000 lb., from Chazy, N. Y., to Cadosia and Kerry's to Walton, inclusive, (A) 17c, (B) 16c per 100 lb.; Colchester to Delhi, inclusive, (A) 19½c, (B) 19c per 100 lb., Northfield to South Unadilla, inclusive, New Berlin Junction; Rockdale to Edmeston, inclusive, and Parker to Earlville, inclusive, (A) 17c, (B) 16c per 100 lb. Reason—Proposed rates are on the same basis as published from York, Penn.

14391. **Oyster shell** lime, carloads, minimum weight per Official Classification, from Reading, Penn., to Philadelphia, Penn., 9c per 100 lb Reason—The rate compares favorably with rate now published from Philadelphia to Reading, Penn., as per P. & R. Ry. Trf. I. C. C. J8641.

14426. Building and chemical **lime,** carloads, minimum weight 30,000 lb., from Riverton, Carson and Karo, Va., to Boston, Mass., and points taking same rates, 25c per 100 lb. Reason—Proposed rate same as now applicable from Strasburg, Va., continuous to Riverton, Carson and Karo, Va.

NEW ENGLAND FREIGHT ASSOCIATION DOCKET

11405. **Lime** and limestone, agricultural, in carloads, minimum weight 50,000 lb., from Winooski, Vt., to stations on Southern Division, C. V. Ry., Woodruff, Vt., to New London, Conn., inclusive, 13½. Reason—Comparable with the basis in effect locally on the B. & M. and N. Y., N. H. & H. R. Rs.

ILLINOIS FREIGHT ASSOCIATION DOCKET

1068. **Gravel,** novaculite or gannister, carloads, from Elco and Gravel Pit, Ill., to Rockwood, Cora City, Jones Ridge, Raddle, Jacob, Gorham, Johns Spur, Cave Valley, Howardton, La Rue, Wolf Lake, Ware, Potts and Reynoldsville, Ill. (rates per net ton). Present, class or combination, whichever are lower; proposed, $1.14.

THE following are the latest proposed changes in freight rates up to the week beginning January 3:

SOUTHERN FREIGHT ASSOCIATION DOCKET

30988. **Limestone** from Ladds, Ga., to Marianna, Fla. It is proposed to revise the rates on limestone, ground or pulverized, carloads, minimum weight marked capacity of car, except when cars are loaded to full visible capacity, actual weight will govern, from Ladds, Ga., to Marianna, Fla., from 345c per ton 20,000 lb. to 306c per ton 2000 lb. Proposed rate made in line with rate recently authorized from Whitestone, Ga., to Marianna, Fla.

31021. **Limestone** or marble, ground or pulverized, carloads, from Ladds, Cartersville and Portland, Ga., to Jacksonville, Fla.—application of Agt. Jones' combination tariff. It is proposed to make the rates on limestone or marble, ground or pulverized, carloads, from and to points named, subject to Agt. Jones' Rules for Constructing Combination Rates as set forth in his I. C. C. U. S. 1. The rates in question were made same as from Whitestone to Jacksonville, and the rates from Whitestone are subject to Agt. Jones' tariff in question.

31096. **Molding sand** from Ohio River crossings to stations in Tennessee. It is proposed to revise present rates on molding sand, carloads, from Evansville, Ind., and Cairo, Ill., to Harriman, Knoxville, Lenoir City, Athens and Cleveland, Tenn., and interdemediate points on C. N. O. & T. P. Ry. and So. Ry., the present Class "A" differential of 50c per net ton over the current rates from Louisville, Ky., in addition to establishing same rate from Cincinnati and Louisville to Lenoir City, Athens and Cleveland.

31154. **Limestone** from Mascot, Tenn., to Chicago, Ill. Present rate, 657c per net ton. Proposed rate on limestone, ground or pulverized, carloads, minimum weight marked capacity of car, but not less than 66,000 lb., from Mascot, Tenn., to Chicago, Ill., 373c per net ton, made with relation to current rate from Cartersville, Ga., to Chicago, Ill.

31157. **Crushed stone** from Smyth, N. C., to Bladenboro, N. C. Lowest combination now applies. Proposed rate on crushed stone, coated with oil and/or asphaltum, carloads, from Smyth, N. C., to Bladenboro, N. C., 300c per net ton.

31169. **Broken and crushed stone** from Celera, Ala., to Southeastern and Mississippi Valley points, South Atlantic and Gulf ports. It is proposed to establish commodity rates on broken and crushed stone, carloads, minimum weight 90% of marked capacity of car, except when cars are loaded to their visible capacity, actual weight will govern, from Calera, Ala., to specified destinations in Southeastern and Mississippi Valley territories, and to South Atlantic and Gulf ports, made on basis of the proposed Georgia-Alabama scale, less 10%, except the rate proposed to Port Chalmette is the same as suggested to New Orleans, and to Port Wentworth, the same as suggested to Savannah, Ga. Statement of present and proposed rates to the destinations involved will be furnished upon request.

31188. **Limestone or marble,** ground or pulverized, from Cartersville, Ga., to Oxford, Ala. Present rate, 197c per net ton (Rockmart, Ga., combination). Proposed rate on limestone or marble, ground or pulverized, carloads, minimum weight marked capacity of car, except when cars are loaded to their full visible capacity, actual weight will govern, from Cartersville, Ga., to Oxford, Ala., 176c per net ton, made on basis of proposed Georgia Joint Line Scale, reduced 10%.

CENTRAL FREIGHT ASSOCIATION DOCKET

14721. **Sand and gravel,** carloads, siding of the East Liverpool Sand Co., east of Leetonia, Ohio, to Newton Falls, Ohio. Present rate: No through class or commodity rate in effect; proposed, 80c per ton of 2000 lb.

14724. **Lime,** carloads, Hannibal, Mo., White Bear and White Rock, Mo., Marblehead, Quincy and Springfield, Ill., and points taking same rates, as shown on pages 25 to 42, inclusive, of Agent Boyd's Tariff 58-M, I. C. C. A-1552, to Evansville, Ind., and points on the St. Louis division of the L. & N. R. R.

To—	Present	Proposed
Evansville, Ind.	*12½	*16½
Ashley, Ill.	19	16½
Enfield, Ill.	20½	16½
Carmi, Ill.	10	16½

*Subject to intermediate note providing for the application of the more distant point rates to intermediate destinations.

Jones' Combination Tariff—Suggested rates are to be made subject to Agent Jones' Combination Tariff 228.

14727. **Crushed stone,** carloads, Ingalls, Ind., to Shidelers and Eaton, Ind. Present rates: 13c to Eaton, Ind., and 92c per net ton to Shidelers, Ind.; proposed, 88c per net ton.

14743. **Sand and gravel,** carloads, East Liverpool, Ohio, to points in Ohio, folowing rates:

To—	Proposed rate	Present rate
Robertsville, Ohio	80	90
Carrolton, Ohio	85	90
Amsterdam, Ohio	100	110
Kent, Ohio	100	120

14744. **Crushed stone,** carloads, East Liberty, Ohio, to New Bremen and Minster, Ohio. Present rate, 90c per net ton; proposed, 70c per net ton.

14745. **Crushed stone,** carloads, Spore, Ohio, to Akron, Ohio. Present rate, 90c per net ton; proposed, 80c per net ton.

14746. **Crushed stone,** carloads, Hillsville-Walford district to Rocky River, Sterling, Lester, Erhart, Grafton, Elyria, Berea, South Brooklyn and Lorain, Ohio, also to intermediate points west of a line from Rocky River through Cleveland and Akron, Ohio, to Orrville, Ohio. Present rate, 90c per net ton; proposed, 105c per net ton.

ILLINOIS FREIGHT ASSOCIATION DOCKET

3962. **Sand and gravel,** carloads, from Chillicothe, Ill. From combination rates to:

To—	Per net ton. Prop.	To—	Per net ton. Prop.
Callaway, Ill.	113	Pawnee Jct., Ill.	113
Kincaid, Ill.	113	Beechley, Ill.	125
Humphrey, Ill.	113	Auburn, Ill.	125
Sicily, Ill.	113	Compro, Ill.	125
Pawnee, Ill.	113		

3964. **Lime,** carloads, minimum weight 30,000 lb. from Hannibal, Louisiana, White Bear and White Rock, Mo., Marblehead, Quincy and Springfield, Ill., to Evansville, Ind., also points on the St. Louis division of the L. & N. R. R.

To—	Present	Proposed
Evansville, Ind.	12½	*16½
Ashley, Ill.	19	16½
Enfield, Ill.	20½	16½
Carmi, Ill.	10	16½

*Subject to intermediate note providing for the application of the more distant point rates to intermediate destinations.

WESTERN TRUNK LINE DOCKET

4119-A. **Lime,** carloads, minimum weight 38,000 lb., from Mankato, Minn., to River Falls, Wis. Present, 20½c per 100 lb. (Class C); proposed, 12c per 100 lb.

Combination Rates on Sand and Gravel in Chicago District

BY an order entered on November 19 in Investigation and Suspension Docket No. 2796, the Interstate Commerce Commission suspended from November 20, 1926, until March 20, 1927, the operation of certain schedules as published in Agent C. W. Galligan's tariff I. C. C. No. 84.

The suspended schedules propose to apply combination rates in lieu of the present through rates on sand and gravel, in certain instances, between points outside the Chicago terminal district and points within the terminal district which would result in increased charges on this traffic.

Co-ordinate Lime Rates

THE Interstate Commerce Commission, in No. 13014, Lehigh Lime Co. vs. Akron, Canton & Youngstown et al., 85 I. C. C. 341; I. and S. No. 2096, Lime from Eastern Trunk Line Points to Pittsburgh, Penn., Youngstown, Ohio, and Related Points, 93 I. C. C. 617; No. 16170, Eastern Lime Manufacturers' Traffic Bureau et al. vs. Akron & Barberton Belt, 112 I. C. C. 7; and No. 16170 (sub. No. 1), Washington Building Lime Co. et al. vs. Akron & Barberton Belt et al., 112 I. C. C. 7, has issued an order requiring the railroads to establish rates not later than January 20, in accordance with the formula therein set forth.

The order is preceded by a brief review of the orders in the cases mentioned and the fact that this revised order is issued upon further consideration of the records in the cases mentioned, and upon the joint petition of the Lehigh Lime Co. and the Central Freight Association lines. The substantive parts of the order, put out in mimeographed form, are as follows:

It is ordered, That the fifth paragraph on page (III) of the said orders of December 21, 1923, in No. 13014, and the fourth paragraph on pages (I) and (II) of the said order of December 13, 1924, in No. 2096, be, and they are hereby, vacated and set aside and the following substituted therefor:

It is further ordered, That defendants and respondents herein, according as they participate in the transaction, be, and they are hereby, notified and required to cease and desist from practicing the undue prejudice and undue preference and advantages found in said report to exist, and to establish, on January 20, 1927, upon notice to this commission and to the general public by not less than 30 days' filing and posting in the manner prescribed in section 6 of the interstate commerce act, and thereafter to maintain and apply to the interstate transportation of lime, in carloads, from Buckeystown, Frederick, Grove, and Lime Kiln, Md., Bakerton and Engle, W. Va., Stephens City and Strasburg, Va., and York, Penn., destinations in central territory in Pennsylvania, West Virginia, Ohio and Michigan rates which shall bear the following relationship to the contemporaneous rates from Mitchell, Ind., to the same destinations:

From Buckeystown, Frederick, Grove, Lime Kiln, Bakerston, Engle, Stephens City, Strasburg, and York, on the basis of the specific rates prescribed as reasonable in Eastern Lime Mfrs. Traffic Bureau vs. A. & B. B. R. R. Co., 112 I. C. C. 7.

From Mitchell, on the basis of the distance scale of rates found reasonable from Ohio producing points to the same destinations in Eastern Lime Mfrs. Traffic Bureau vs. A. & B. B. R. R. Co., 112 I. C. C. 7.

Silica Sand Rates

EXAMINER C. H. PECK has recommended the dismissal of No. 17822, River Raisin Paper Co. vs. Chicago, Burlington and Quincy et al. on a finding that the rate on silica sand from the Ottawa district in northern Illinois to Monroe, Mich., is not unreasonable or inapplicable. The complaint, as amended, alleged that a rate of $2.90 per net ton was unreasonable to the extent it exceeded $2. The complainant contended that the applicable rate was $2.65, on the ground that because of the absence of routing instructions, Monroe, Mich., was intermediate to Addison or Lansing, Mich., over routes that could be used.

Plan Readjustment of Southern Cement Rates

RATES on portland cement between points in southern territory, including the Mississippi valley section and from points in trunk line and central territories to destinations in the southern states were recently recommended in a proposed report submitted by Examiner J. T. Money to be unreasonable and unduly prejudicial. The report prescribed reasonable basis of rates for the future and recommended the commission deny reparations.

The report embraces complaints brought by the Lehigh Portland Cement Co., the Alpha Portland Cement Co., the Security Cement and Lime Co., and the Tidewater Portland Cement Co. A number of other cement manufacturers in all parts of the country intervened during the course of the proceedings.

All present rates on cement, both state and interstate, within the southern states from Atlantic and Gulf ports, in the Southern Mississippi Valley, and into the South from northern and eastern states are found to be unreasonable and a new scale of rates is prescribed by the examiner. Opportunity will be given both shippers and railroads to file exceptions to the proposed report, after which it will be passed upon by the commission.

The territory embraced in the case includes Virginia and Kentucky and all of the southern states south of them and east of the Mississippi River, including that part of Louisiana east of the Mississippi. The Interstate Commerce Commission sought the co-operation of the state public service commissions of the 10 southern states involved, and a committee representing these states was appointed and sat with the examiner presiding at the hearings. This committee consisted of R. Hudson Burr of the Railroad Commission of Florida, H. H. Hannah of the Tennessee Railroad and Utilities Commission, and A. J. Maxwell of the North Carolina Corporation Commission.

The examiner lays down a scale of rates based on mileage, which he recommends be ordered to replace all of the rates involved. The railroads proposed one scale and the shippers another, and he held that the first would increase the cement freight bill in the South, while the other would lower it. His scale of rates lies intermediate of them.

Silica Sand Rates Unreasonable

EXAMINER Raymond W. Stough, in No. 17272, Procter & Gamble Co. vs. Baltimore & Ohio et al., and two sub-numbers thereunder, Philip Carey Manufacturing Co. et al vs. Same; Nivison-Weiskopf Co., et al. vs. Same; and No. 17338, Charles Boldt Glass Co. vs. Same, said the commission should find the rates on silica sand, from the Ottawa district in Illinois to Cincinnati unreasonable but not otherwise unlawful. He said the rates should be found unreasonable to the extent they exceeded $2.90 per ton prior to July 1, 1922, and $2.60 per net ton on and after that date, award reparation to that basis to the complainants and Lunkenheimer Co., an intervener, and prescribe the lower rate for the future. He said the question of the rate on silica sand to Cincinnati had been raised several times in the last 15 years. The complaining points of destination are Lockland, Ivorydale, Carthage, Reading, Bond Hill and Carrel Street Station, points within the Cincinnati switching district.

Carriers objected to any reduction in the $2.90 rate, because, they said, it would require reduction in other rates so as to avoid fourth section departures. They wished to preserve a $2.90 group, including Cincinnati, although to Carrel Street Station in Cincinnati they had published a lower rate. The examiner said it was not certain that any such widespread reductions in the $2.90 rate as the carriers indicated, would necessarily follow, but that even if reductions were necessary that fact was not a reason for refusal to give a lower rate to the complainants.

Postpone Hearing on Proposed Increase on Louisiana Sand and Gravel

FINAL hearings on the proposed 50% increase of sand and gravel rates between Louisiana points will be held before Special Examiner D. A. Disque at New Orleans on February 7. Testimony will be presented by sand and gravel producers, highway commissions and other interested parties at that time. At an earlier meeting in Shreveport practically all the evidence heard was from proponents for the increase.

Basic Products Company to Make Portland Cement

A RECENT announcement in the Huntington, W. Va., *Advertiser* states that the Basic Products Co. will start the production of portland cement at their Kenova, W. Va., lime plant within a short time. A formal statement to that effect has been given out by A. T. Wood, general manager of the company. The cement will be marketed in the vicinity.

According to Mr. Wood, changes in equipment at the Kenova plant are already under way and are expected to be completed early next year. Production and shipments of the finished cement are scheduled to begin about March, 1927. Deposits of raw cement material have been acquired near Ashland, Ky., and developments are well under way so that shipments to Kenova may be started within a short time. An extensive advertising campaign for the new cement, which is to be called "Basic Portland Cement" is included in the plans for marketing.

The Basic Products Co. operates a large crushing plant and lime plant at Kenova, W. Va. The annual output is about 400,000 tons of dolomitic limestone and about 106,000 tons of high magnesium lime produced from rotary kilns, coal fired. G. S. Davidson is president of the company. The main office is in the Oliver Bldg., Pittsburgh, Penn.

Canada Cement Unveils Safety Monument

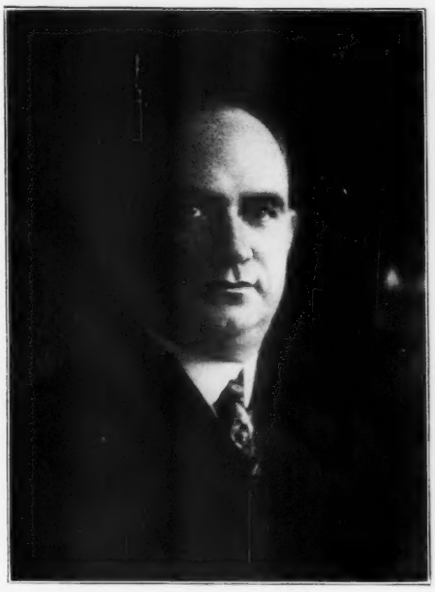
PLANT No. 8 of the Canada Cement Co., at Port Colborne, Ontario, recently celebrated the dedication of the safety monument which it was awarded by the Portland Cement Association for completing a whole year's operations without one accident involving loss of time. A similar trophy was awarded the Duluth (Minn.) plant of the Universal Portland Cement Co., an illustration and description of which appeared on page 65 of the December 11 issue of Rock Products. The Canadian plant had a perfect no-accident record for not only one year, but 521 days.

The unveiling of the monument was a most memorable occasion. The 250 employees responsible for the splendid record and many prominent visitors were present. The ceremony was performed by G. S. Brown, president of the Portland Cement Association and of the Alpha Portland Cement Co., Easton, Pa., who was supported by Major H. A. Renniger, vice president of the National Safety Council, Lehigh Portland Cement Co., Allentown, Pa.; A. J. R. Curtis, assistant general manager of the Portland Cement Association, Chicago; H. G. Jacobsen, former manager of the Bureau of Accident Prevention and Insurance, Portland Cement Association; R. S. Huey, superintendent of the Universal Portland Cement Co., Duluth, Minn.; A. C. Tagge, assistant general manager of the Canada Cement Co., Ltd., Montreal; the mayor of Welland and the mayor of Port Colborne.

This plant also holds the distinction, it is said, of being the first in the Dominion of Canada to show a perfect record for a whole year.

C. L. Hogan New Vice-President of International Cement

CHARLES L. HOGAN, Albany, N. Y., has been promoted to the vice presidency of the International Cement Corporation of New York City, according to a recent announcement appearing in the Albany (N. Y.) *Telegram*, to succeed R. F. Hoyt.



Charles L. Hogan

Mr. Hogan was formerly vice president of the Knickerbocker Portland Cement Co., Inc., at Albany, and also vice president of the Indiana Portland Cement Co. of Indianapolis, Ind., two subsidiaries of the International Cement Corporation. He has also been an executive for cement companies in the Middle West. He is a native of Kansas City, Mo.

National Lime Association Has New Headquarters

THE National Lime Association announces a change in address, which became effective November 22. The headquarters of the Association are now located at 927 Fifteenth St., N. W., Washington, D. C., instead of 918 G St., N. W.

The move is due, R. P. Brown, manager of the publicity department states, to the steadily increasing demand for detailed information. This has necessitated expansion of both the field and office staff and a corresponding broadening of the activities of the Association, all of which required larger quarters.

Tomkins Cove Stone Company Sold to New York Trap Rock Corp.

ACCORDING to recent reports all the properties and assets of the Tomkins Cove Stone Co. have been sold to the New York Trap Rock Corp., New York, N. Y. A new issue of $6,500,000 first mortgage bonds of the New York Trap Rock Co. which will be used in part for the purchase of the Tomkins Cove Co., has been purchased by William R. Compton Co. and E. H. Rollins and Sons and will be offered to the public. The complete details of this offering may be found on one of the financial pages of this number of Rock Products.

The New York Trap Rock Corp. is one of the oldest producers of crushed stone in the United States. Previous to acquisition of the Tomkins Cove Co., quarries and crushing plants were operated at Verplanck Point, Cedar Cliff, and Clinton Point, N. Y. With the addition of the Tomkins Cove properties at Tomkins Cove and Haverstraw, N. Y., the company now owns and operates five of the largest crushing plants in the country. The Verplanck plant was recently rebuilt and descriptions were published in this journal June 13 and Dec. 26, 1925. The plant at Tomkins Cove was described in the Sept. 23 (1922) issue. A partial description of the plant and operations at the new Haverstraw plant may be found elsewhere in this issue and a complete story will be published in an early issue.

All the quarries produce principally ballast, roadstone and concrete aggregate, which is shipped by direct water route into the New York territory. There are also rail connections at all but one of the plants. The rock quarried is trap rock, limestone and dolomite. There are about 1,873 acres of these deposits containing a large supply of these rocks.

W. M. Waudell is the general manager of the company and R. T. Gent, general superintendent of the quarries. Offices are maintained at 101 Park Ave., New York.

Install Kilns, 219 Feet Long, in New Orleans Plant

THE two huge kilns, each 10 x 219 ft., which the Louisiana Portland Cement Co., New Orleans, La., ordered from Reeves Bros., Birmingham, Ala., as announced in the October 2 issue of Rock Products, are now in place in the new plant the company is building in New Orleans, we are officially informed.

The Louisiana Portland Cement Co. is a subsidiary of the International Cement Corporation, New York City. H. Struckmann is president and general manager, and H. A. Ross manager of the plant.

The company recently purchased two tracts of land aggregating 533 acres and took out an option on 180 acres in addition.

Work Progressing Rapidly on New National Gypsum Plant

RAPID progress is being made in the erection of the plant the National Gypsum Co., is establishing at Emery Junction, Mich., according to a report in the Bay City (Mich.) *Lime Tribune*, and the company hopes to have it ready for operation within the next three months. Announcement of the proposed plant was made in the September 4 issue of ROCK PRODUCTS.

In the meantime work of opening the company's gypsum quarry is progressing, and it is planned to have not less than 300,000 tons quarried, it is said, and ready for use when the plant starts operation. A car load of the rock has been shipped to the company's plant at Clarence, N. Y., to be used for test purposes.

J. F. Haggerty, Buffalo, is president and secretary of the company, and C. E. Williams, Chicago, vice president and treasurer. The company's offices are located at 415 Jackson Bldg., Buffalo.

Rock Asphalt Company Increases Holdings

THE Colbert Lime Rock Asphalt Co., Cherokee, Ala., according to an item recently appearing in the Birmingham (Ala.) *Herald*, has increased its holdings by purchasing a site in the basin near Cherokee, which is said to contain several million tons of the asphalt rock. The company is also reported to have increased its former capital stock of $150,000 to $500,000.

In the reorganization of the company, R. P. Jones of Vicksburg, Miss., was chosen as president of the company; Walker Stansell as vice-president in charge of sales; T. C. Sanford, secretary and treasurer; J. F. Gammon, vice-president in charge of production, and J. L. Andrews, chairman of the board of directors.

The daily output of the company at the present time is 500 tons asphaltic limestone. The works are located at Colrock Spur near Cherokee.

Operations Started at Western Diatomaceous Earth Plant

THE National Magnesia Manufacturing Co., Redwood City, Calif., announces that the new treating plant for diatomaceous earth which was started in July, was completed and had its initial test run about December 1. The plant consists of two kilns each 80 ft. long and 8 ft. in diameter, the necessary milling and cyclone equipment for grinding, as well as a complete packing plant, with the most up-to-date machinery installed throughout.

With the new plant, the company is capable of producing and delivering 100 tons per day of quarry-run crude diatomaceous earth or "Dia-Sil," the company's trade name for the product, as well as a similar amount of powdered "Dia-Sil." There is also equipment to crush the material to any size desired by the purchaser. The calcination equipment is capable of delivering a calcined product, either powdered or mill-run, of approximately 40 tons daily. Since the plant is located three-fourths of a mile from the railroad siding, the company has its motor trucking system from the packing department to the above site.

The company is also producing "Dia-Sil" insulating brick, which is a molded calcined product.

C. E. Miller is president, Frank B. Peterson vice president, and E. C. Martin secretary. Offices are maintained at 544 Market St., San Francisco.

Limestone Company to Open Second Quarry

E. H. SCHULTZ, president of the Western Limestone Co., Wilson, Wis., announces that his company will open a second quarry at Burkhardt, near New Richmond, Wis., shortly, according to the Menominee (Wis.) *News*. The new quarry, Mr. Schultz states, will be opened as soon as weather permits in the spring.

There are about 20 acres in the new deposit, located on the Northwestern Railroad between Burkhardt and New Richmond. The rock is said to be high in calcium carbonate and the deposit has practically no overburden, which is unusual in this section of the country. The removing of this overburden will undoubtedly be done by hydraulic stripping, as it is so located that it can be handled to advantage.

By opening this second quarry, the Western Limestone Company, it is said, will so increase its output that it will be in a position to supply crushed limestone rock in any volume required for roads. Arrangements are also being made for a sand pit in the locality.

First Cement To Be Shipped by Airplane

ANOTHER chapter in the history of commercial aviation as well as in the cement industry was written on September 14, we are advised, when the Virginia Portland Cement Corporation, subsidiary of the International Cement Corporation, New York City, shipped a bag of its "Lone Star" cement by airplane from Norfolk to Philadelphia.

So far as is known this is the first time that cement has been transported by airplane. It establishes a new record for delivery which normal service will find it difficult to eclipse.

The bag, a 10-lb. sample, consigned to E. L. Conwell and Co., testing engineers, of 2024 Arch St., Philadelphia, was carried by the first plane in the new Norfolk-Washington-Philadelphia air express service.

The shipment of cement was delivered to the flying field at East Camp, Norfolk, by truck, transferred to the waiting plane, and a few hours later it arrived in Philadelphia.

Presbey-Leland Company Plan Granite Crushing Plant

ANNOUNCEMENT is made in the Brattleboro (Vt.) *Reformer* that the Presbey-Leland Quarries, Inc., of that city, operating the West Summerston granite quarry, are putting in a crushing plant. The material to be crushed is waste granite from the company's cut stone operation which, after crushing and sizing, will be sold as ballast, road material and concrete aggregate. The estimated cost of the new installation is about $15,000.

The plant will be equipped with a No. 16 jaw crusher made by the Good Roads Machinery Co., Kennett Square, Penn., which has a rated capacity of from 50 to 60 tons per hour, running so as to make 2 in. and under. The crusher will be located beside the railroad siding so as to facilitate delivery either into cars or trucks or storage bins. Sizing will be done by a 24 ft. x 51 in. diameter Champion rotary screen. Provision has been made for the erection of storage bins of 600-yd. capacity. The entire plant will be driven by a 50-hp. electric motor. Operation is expected to begin early in 1926.

New California Company Will Manufacture Gypsum Product

THE Panel-Built Construction Co., recently organized at Glendale, Calif., has leased the plant of the Thermosoid Construction Co., Colorado and San Fernando Sts., that city, and will begin the manufacture of a gypsum product under the trade name of "panel-built." This announcement was made by A. W. Hewitt, city industrial agent, according to the *Glendale News*.

Members of the new company are Dr. C. G. Snow, E. J. Phelan, Henry G. Johnson, and James G. Cortelyou, all of Los Angeles. The product is a type of fireproof and soundproof gypsum wallboard. It is designed for interior walls in fireproof buildings.

James E. Rodes

JAMES E. RODES, president of the Franklin Limestone Co. of Nashville, Tenn., died at his home in Nashville on December 6. Mr. Rodes was one of the prominent men of Nashville and the central section of the south and the company which he headed is one of the largest and most important stone producers south of the Ohio, with three good sized plants in operation near Nashville.

Mr. Rodes was an active supporter of the work of the National Crushed Stone Association and his company was responsible for the formation of the Tennessee Crushed Stone Association. His death has brought the sympathy of the members of both these associations to the bereaved family.

Oregon Cement Companies Merge

ACCORDING to an announcement in the Portland (Ore.) *Oregonion*, the Sun Portland Cement Co., operating a plant at Lime, Ore., and the Oregon Portland Cement Co., with plant at Oswego, Ore., have combined to form one company to be known as the Oregon Portland Cement Co. There will be no change in personnel or policy, the report states, the new company merely maintaining and extending the service rendered by the former companies and supplying the trade with either Oregon or Sun brands as desired.

A short time ago, stockholders of both companies were asked to approve merger plans drawn up by the directors. The letters and announcements carried the signatures of R. P. Butchart, president of both companies; H. A. Ross, vice-president of the Sun company; L. C. Newlands, vice-president and general manager of the Oregon company; H. L. Knappenberger, general manager of the Sun company; Edward Cookingham, vice-president of the United States National Bank, Portland; and E. B. Ireland, manager of the Portland branch, Canadian Bank of Commerce.

The capital changes to be effective in case of ratification were as follows: An outstanding $1,500,000 of 7% cumulative sinking fund first preferred voting stock would be established; $1,430,300 of 7% convertible preferred stock, convertible into class B no-par common shares at the rate of one for four, and 71,515 shares of class A no-par common voting stock and 57,212 shares of class B, no-par non-voting common stock. Holders of preferred shares of the existing companies were to be allowed to exchange for the new 7% preferred, share for share.

The combined balance sheet as of that time (September, 1926) gave a value to plants and assets of the consolidated company of $3,145,450. The merger details also included plans for increasing the capacity of the Sun plant to 700,000 bbl. per year.

Although the complete financial details of the merger are lacking, it is believed that the plan as outlined above was accepted by the stockholders and will be the basis of the new financial structure of the consolidated company.

Largest and Most Powerful Dipper Dredge

UTILIZING a dipper pull of 350,000 lb.—more than the pull of the largest dredges used in the construction of the Panama Canal—the Diesel-electric dredge "Crest" is now being used for rock removal work in New York harbor off Staten Island. This dredge, 167 ft. long and 48 ft. wide, is the largest and most powerful dipper dredge ever built.

The dredge is owned by the Great Lakes Dredge and Dock Co. and was built by the Bucyrus Co. It is not self-propelled but is otherwise completely electrified, using General Electric equipment. The main power plant consists of two 600-hp. Fairbanks-Morse 6-cylinder Diesel engines of the two-cycle solid injection type, driving direct-current generators supplying 230-volt power. For standby purposes a 120-hp. two-cycle Diesel engine is used. Two 125-volt generators driven by two 7½-hp. Diesel engines furnish lighting current.

The unusual power of the dredge is necessary because the equipment is designed to dig in blasted or partly blasted rock. Because of the severity of its present duty, the dipper at present in use has a capacity of but 10 cu. yd., although in lighter digging a dipper of 15 cu. yd. capacity can be utilized. The dredge is designed to dig to a depth of 52 ft.

Seven main motors, with a total rating of more than 1400 hp., are used in the dredging operations. These drive the thrust, hoist, backing, swing and spud machinery. The spuds alone are 85 ft. long and 51 in. square. In all, the boat is equipped with 35 electric motors. The main hoist is of the single-part type and operates through twin cables 2⅜ in. in diameter, reeved over 9-ft. boom point sheaves.

Besides the electrical equipment described, many conveniences are provided for the crew. Shower baths with hot and cold water are part of these accommodations, and a social hall is included for the men. The galley is equipped with a cold storage system.

Maxim silencers muffle the noise of the large engines.

New Company to Operate Old Arkansas Quarry

THE Little Rock Stone Co., just recently organized and incorporated for $75,000, will soon start operations at an old quarry located in Little Rock, Ark., near the Rock Island tracks in the northwestern part of the city, according to the Little Rock (Ark.) *Gazette*.

Equipment is being installed at the quarry and when completed the plant will be worth $75,000, according to officers of the company. Offices will be maintained there temporarily, and later will be moved downtown, it was said. The quarry was abandoned several years ago.

Officers of the new company are J. W. Carmean, president and treasurer; Frank Carmean, vice-president, and Frank Carmean, Jr., secretary. Of the $75,000 capital stock, $25,000 is said to have been subscribed. Three thousand shares of stock, with par value of $25 each, are to be issued.

Commercial stone suitable for buildings and roads will be produced beginning early next month, the officers said. About 65 men will be employed.

U. S. Gypsum Head Chosen as Trustee of University

S. L. AVERY, president of the United States Gypsum Co., Chicago, Ill., was added to the board of trustees of the University of Chicago recently.

Mr. Avery, a resident of Evanston, Ill., is a graduate of the University of Michigan, where he received his Bachelor of Laws degree in 1894.—*Chicago Daily Tribune.*

San Antonio Portland to Add Third Kiln

EXTENSIVE additions and improvements, which include the addition of a third kiln, are under way at the Cementville, Tex., plant of the San Antonio Portland Cement Co. The new kiln will increase the mill capacity to 3500 bbl. per day.

A community house for the workers, a large service laboratory, new office building, warehouse and other lesser structures are to be erected. The clinker shed will be enlarged by an 180-ft. addition. The preliminary work on the expansion has been already started and construction is expected to be completed within a short time.—*San Antonio (Tex.) Light.*

Complete Extensions at Penn-Dixie No. 2 Plant

DURING the past few months a considerable amount of extension and construction work has been completed at the cement plant at Clinchfield, Ga., now designated as No. 2 plant of the Pennsylvania-Dixie Cement Corp., since the recent merger.

A third unit extension has been completed, increasing the production capacity to 3600 bbl. per day. Other new construction includes new concrete storage silos and a $30,000 crushing unit at the raw end. The storage capacity is now 140,000 bbl., an increase of 60,000. All the new construction work was carried out by the Spencer Construction Co., Baltimore, Md.

$80,000 Fire Loss at Bromide Crushing Plant

THE crushing plant of the Bromide Crushed Rock Co., Bromide, Okla., was damaged to the extent of $80,000 by a recent fire, acording to a report in the Tulsa (Okla.) *Tribune*. The fire was said to have started in the engine house and spread rapidly throughout the plant. The loss is partly covered by insurance. Work on rebuilding the plant will be started immediately, according to A. F. House, president of the company.

The plant, up to the time of the fire, was operating on a capacity basis to furnish road stone and about 20 cars per day of ballast to the K. O. and G. R. R. Co. A 2000-car contract for railroad ballast which had been started on will have to be postponed until the rebuilt plant is in operation.

The Rock Products Market

Wholesale Prices of Crushed Stone

Prices given are per ton, F.O.B., at producing point or nearest shipping point

Crushed Limestone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:						
Buffalo, N. Y.	1.30	1.30	1.30	1.30	1.30	1.30
Chaumont, N. Y.	.50	1.75	1.75	1.50	1.50	1.50
Chazy, N. Y.	.75	1.65	1.65	1.40	1.40	1.40
Danbury, Conn.	1.50@2.00	2.00	1.75	1.50	1.35	1.25
Dundas, Ont.	.53	1.05	1.05	.90	.90	.90
Frederick, Md.	.50@ .75	1.20@1.30	1.15@1.25	1.10@1.15	1.10@1.15	1.05@1.10
Munns, N. Y.	1.00	1.50	1.50	1.50	1.25	
Northern New Jersey	1.60	1.50@1.80	1.30@2.00	1.40@1.60	1.40@1.60	
Prospect, N. Y.	1.00	1.50	1.40	1.30	1.30	
Walford, Penn.	.70		1.35h			
Watertown, N. Y.	1.00		1.75	1.50	1.50	1.50
Western New York	.85	1.25	1.25	1.25	1.25	1.25
CENTRAL						
Alton, Ill.	1.85		1.85			
Bloomville. Middlepoint, Dunkirk, Bellevue, Waterville, No. Baltimore, Holland, Kenton, New Paris, Ohio; Monroe, Mich.; Huntington, Bluffton, Ind.	1.00	1.10	1.10	1.00	1.00	1.00
arey, Ohio	1.05	1.05	1.05	1.05	1.05	1.05
.hasco, Ill.	1.00@1.30		1.00@1.15		1.00@1.15	
Columbia and Krause, Ill.	1.00@1.50	.90@1.10	1.20@1.35	1.00@1.20	.90@1.20	
			Flux 1.50@1.75			
Greencastle, Ind.	1.25	1.25	1.15	1.05	.95	.95
Lannon, Wis.	.80	1.00	1.00	.90	.90	.90
Linwood and Buffalo, Ia.	1.10		1.30	1.20	1.25	1.25
McCook, Ill.	1.00	1.25	1.25	1.25	1.25	1.25
Milltown, Ind.		90@1.10	.90@1.15	.90@1.00	.85@.90	.85@.90
River Rouge, Mich.	1.20	1.20	1.20	1.20	1.20	1.20
St. Vincent de Paul, Que.	.75	1.20@1.45	.90@1.15	.90@ .95	.85	.85
Sheboygan, Wis.	1.10	1.10	1.10	1.10	1.10	1.10
Toledo, Ohio	1.60	1.70	1.70	1.60	1.60	1.60
Toronto, Ont.	1.55	2.05	2.05	1.90	1.90	1.90
Stone City, Iowa	.75		†1.10	1.05	1.00	
Waukesha, Wis.	.90	.90	.90	.90	.90	
SOUTHERN:						
Alderson, W. Va.	.50	1.35	1.35	1.25	1.20	1.15
Atlas, Ky.		1.00	1.00	1.00	1.00	1.00
Brooksville, Fla.	.75		2.65	2.65	2.40	2.00
Carterville, Ga.		1.50	1.50	1.35	1.15	1.00
Chico, Tex.	.75	1.35	1.25	1.20	1.10	1.00
El Paso, Tex.	1.00	1.00	1.00	1.00		
Ft. Springs, W. Va.	.50	1.35	1.35	1.20	1.20	
Graystone, Ala.			Crusher run, 1.00 per ton			
Kendrick and Santos, Fla.			3½ in. and less, 1.00 per ton			
New Braunfels, Tex.	.60	1.25	1.10	.90	.90	.90
Rocky Point, Va.	.50@ .75	1.40@1.60	1.30@1.40	1.15@1.35	1.10@1.20	1.00@1.05
WESTERN:						
Atchison, Kans.	.25	1.90	1.90	1.90	1.90	1.80
Blue Springs & Wymore, Neb.	.25	1.45	1.45	1.35c	1.25d	1.20
Cape Girardeau, Mo.	1.25		1.25	1.25	1.10	
Kansas City, Mo.	.75	1.50	1.50	1.50	1.50	1.50
Rock Hill, St. Louis Co., Mo.	1.40	1.45	1.45	1.45	1.45	1.45

Crushed Trap Rock

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Branford, Conn.	.80	1.70	1.45	1.20	1.05	
Duluth, Minn.	.90	2.25	1.90	1.50	1.35	1.35
Dwight, Calif.	1.00		1.00	.90	.90	
Eastern Maryland	1.00	1.60	1.60	1.50	1.35	1.35
Eastern Massachusetts	.85	1.75	1.75	1.25	1.25	1.25
Eastern New York	.75	1.25	1.25	1.25	1.25	1.25
Eastern Pennsylvania	1.10	1.70	1.60	1.50	1.35	1.35
Knippa, Tex.	2.50	2.25	1.55	1.45	1.20	
New Haven, New Britain, Meriden and Wallingford, Conn.	.80	1.70	1.45	1.20	1.05	1.05
Northern New Jersey	1.70	2.20	2.00	1.60	1.60	
Oakland and El Cerito, Cal.	1.00	1.00	1.00	.90	.90	
Richmond, Calif.	.50		1.00	1.00	1.00	
San Diego, Calif.		2.75	2.55	2.35	2.35	
Springfield, N. J.	1.70	2.10	2.10	1.70	1.70	
Toronto, Ont.		3.58@4.05	3.05@3.80			
Westfield, Mass.	.60	1.50	1.35	1.20	1.10	

Miscellaneous Crushed Stone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Berlin, Utley, Montello and Red Granite, Wis.—Granite	1.80	1.70	1.50	1.40	1.40	
Coldwater, N. Y.—Dolomite			1.50 all sizes			
Columbia, S. C.	.75	2.00	1.75	1.75	1.60	1.60
Eastern, Penn.—Sandstone	1.35	1.70	1.65	1.40	1.40	1.40
Eastern Penn.—Quartzite	1.20	1.35	1.25	1.20	1.20	1.20
Lithonia, Ga.	.75	2.00b	1.75	1.40	1.30	1.25
Lohrville, Wis.—Granite	1.65	1.70	1.65	1.45	1.50	
Middlebrook, Mo.	3.00@3.50		2.00@2.25	2.00@2.25		1.25@3.00
Richmond, Calif.—Quartzite	.75		1.00	1.00	1.00	
Somerset, Pa. (sand rock)	1.85@2.00a		1.35@1.50		1.00@1.50	
Toccoa, Ga.			1.40	1.25	1.25	1.25

*Cubic yd. †1 in. and less. ‡Two grades. ||Rip rap per ton. (a) Sand. (b) to ½ in. (c) 1 in., 1.40. (d) 2 in., 1.10 (e) Dust. (f) ¼ in. (h) less 10c discount. (i) 1 in., 1.40.

Agricultural Limestone

(Pulverized)

Alderson, W. Va.—50% thru 50 mesh	1.50
Alton, Ill.—Analysis 99% $CaCO_3$, 0.3% $MgCO_3$; 90% thru 100 mesh	6.00
Asheville, N. C.—Analysis, 57% $CaCO_3$, 39% $MgCO_3$; 50% thru 100 mesh; 200-lb. burlap bag, 4.00; bulk	2.75
Atlas, Ky.—90% thru 100 mesh	2.00
50% thru 100 mesh	1.00
Bettendorf and Moline, Ill.—Analysis, $CaCO_3$, 97%; 2% $MgCO_3$; 50% thru 100 mesh, 1.50; 50% thru 4 mesh	1.50
Blackwater, Mo.—100% thru 4 mesh	1.00
Branchton and Osborne, Penn.—100% thru 20 mesh; 60% thru 100 mesh; 45% thru 200 mesh. (Less 50 cents commission to dealers)	5.00
Cape Girardeau, Mo.—Analysis, 93% $CaCO_3$, 3.5% $MgCO_3$; pulverized; 50% thru 50 mesh	1.50
Cartersville, Ga.—50% thru 50 mesh	1.50
Chaumont, N. Y.—Pulverized limestone, bags, 4.00; bulk	2.50
Chico, Tex.—50% thru 100 mesh, 2.50; 50% thru 50 mesh	1.75
Colton, Calif.—Analysis 90% $CaCO_3$, bulk	4.00
Cypress, Ill.—90% thru 100 mesh	1.35
Ft. Springs, W. Va.—50% thru 4 mesh	1.50
Hillsville, Penn.—Analysis. 94% $CaCO_3$, 1.40% $MgCO_3$; 75% thru 100 mesh; sacked	5.00
Jamesville, N. Y.—Analysis, 89.25% $CaCO_3$; 5.25% $MgCO_3$; pulverized, bags, 4.25; bulk	2.75
Joliet, Ill.—90% thru 100-mesh	4.25
Knoxville, Tenn.—80% thru 200 mesh, 3.00; 80% thru 100 mesh, bags, 3.95; bulk	2.70
Marblehead, Ohio—Analysis, 83.54% $CaCO_3$, 14.92% $MgCO_3$; 60% thru 100 mesh; 70% thru 50 mesh; 100% thru 10 mesh; 80 lb. paper sacks, 5.00; bulk	3.50
Marion, Va.—Analysis, 90% $CaCO_3$, pulverized, per ton	2.00
Mayville, Wis.—Analysis, 54% $CaCO_3$, 44% $MgCO_3$; 90% thru 100 mesh	3.90@ 4.50
Middlebury, Vt.—99% thru 50 mesh, 50% thru 200 mesh	2.00
Milltown, Ind.—Analysis, 94.50% $CaCO_3$, 33% thru 50 mesh, 40% thru 50 mesh; bulk	1.35@ 1.60
Olive Hill, Ky.—50% thru 50 mesh, 2.00; 90% thru 4 mesh	1.00
Piqua, Ohio—Total neutralizing power 95.3%; 99% thru 10, 60% thru 50; 50% thru 100	2.50@ 2.75
100% thru 10, 90% thru 50, 80% thru 100; bags, 5.10; bulk	3.60
99% thru 100, 85% thru 200; bags, 7.00; bulk	5.50
Rocky Point, Va.—Analysis, $CaCO_3$, 95%; 50% thru 200 mesh, burlap bags, 3.50; paper, 3.25; bulk	2.00
Syracuse, N. Y.—Analysis, 89% $CaCO_3$; $MgCO_3$, 4%; bags, 4.25; bulk	2.75
Toledo, Ohio, 30% through 50 mesh	2.25
Waukesha, Wis.—90% thru 100 mesh, 4.50; 50% thru 100 mesh	2.30
Watertown, N. Y.—Analysis, 96-99% $CaCO_3$; 50% thru 100 mesh; bags, 4.00; bulk	2.50
West Stockbridge, Mass.—Analysis 90% $CaCO_3$, 50% thru 100 mesh; cloth bags, 4.75; paper, 4.25; bulk	3.25

Agricultural Limestone

(Crushed)

Alton, Ill.—Analysis 99% $CaCO_3$, 0.3% $MgCO_3$; 50% thru 4 mesh	3.00
Atlas, Ky.—90% thru 4 mesh	1.00
Bedford, Ind.—Analysis, 98.5% $CaCO_3$, 0.5% $MgCO_3$; 90% thru 10 mesh	1.50
Brandon and Middlebury, Vt.—Pulverized, bags, 5.50; bulk	3.50

(Continued on next page)

Agricultural Limestone

Bridgeport and Chico, Texas—Analysis, 94% $CaCO_3$, 2% $MgCO_3$; 100% thru 10 mesh	1.75
50% thru 4 mesh	1.50
Chicago, Ill.—50% thru 100 mesh; 90% thru 4 mesh	.80
Columbia, Krause, Valmeyer, Ill.—Analysis, 90% $CaCO_3$; 90% thru 4 mesh	1.35
Cypress, Ill.—90% thru 50 mesh, 50% thru 100 mesh, 90% thru 50 mesh, 90% thru 4 mesh, 50% thru 4 mesh	1.35
Danbury, Conn.—Analysis, 81 to 85% $CaCO_3$	3.75@ 4.75
Dundas, Ont.—Analysis. 53.8% $CaCO_3$; $MgCO_3$, 43.3%; 50% thru 50 mesh	1.00
Ft. Springs, W. Va.—Analysis, 90% $CaCO_3$; 90% thru 50 mesh	1.50
Kansas City, Mo.—50% thru 100 mesh	.75
Lannon, Wis.—Analysis, 54% $CaCO_3$, 44% $MgCO_3$; 99% through 10 mesh; 46% through 60 mesh	2.00
Screenings (¼ in. to dust)	1.00
Marblehead, Ohio.—Analysis, 83.54% $CaCO_3$, 14.92% $MgCO_3$, 32% thru 100 mesh; 51% thru 50 mesh; 83% thru 10 mesh; 100% thru 4 mesh (meal) bulk	1.60
Mayville, Wis.—Analysis, 54% $CaCO_3$, 44% $MgCO_3$; 50% thru 50 mesh	1.85@ 2.35
McCook, Ill.—90% thru 4 mesh	.90
Middlepoint, Bellevue, Kenton, Ohio; Monroe, Mich.; Huntington and Bluffton, Ind.—Analysis, 42% $CaCO_3$, 54% $MgCO_3$; meal, 25 to 45% thru 100 mesh	1.60
Moline, Ill., and Bettendorf, Iowa—Analysis, 97% $CaCO_3$, 2% $MgCO_3$; 50% thru 100 mesh; 50% thru 4 mesh	1.50
Monroe, Mich. — Analysis, $CaCO_3$, 52.03%; 42.25% $MgCO_3$; 30% thru 100 mesh	2.30
Mountville, Va. — Analysis, 62.54% $CaCO_3$; $MgCO_3$, 35.94%, 100% thru 20 mesh; 50% thru 100 mesh bags	5.50
Pixley, Mo.—Analysis, 96% $CaCO_3$; 50% thru 50 mesh	1.25
50% thru 100 mesh; 90% thru 50 mesh; 50% thru 50 mesh; 90% thru 4 mesh; 50% thru 4 mesh	1.65
River Rouge, Mich.—Analysis, 54% $CaCO_3$, 40% $MgCO_3$; bulk	.80@ 1.40
Stone City, Iowa. — Analysis, 98% $CaCO_3$; 50% thru 50 mesh	.75
Tulsa, Okla.—Analysis $CaCO_3$, 86.15%, 1.25% $MgCO_3$, all sizes	1.25

Pulverized Limestone for Coal Operators

Hillsville, Penn., sacks, 4.50; bulk	3.00
Joliet, Ill.—90% thru 200 mesh	4.50
Piqua, Ohio, sacks. 4.50@5.00 bulk	3.00@ 3.50
Rocky Point, Va.—82% thru 200 mesh, 2.50@3.50 bulk, paper bags	3.75@ 4.75
Waukesha, Wis.—90% thru 100 mesh, bulk	4.50

Glass Sand

Silica sand is quoted washed, dried and screened unless otherwise stated. Prices per ton f.o.b. producing plant.

Berkeley Springs, W. Va.	2.00@ 2.25
Buffalo, N. Y.	2.00@ 2.50
Cedarville and S. Vineland, N. J.—Damp	1.75
Dry	2.25
Cheshire, Mass.	6.00@ 8.40
Columbus, Ohio	1.00@ 1.50
Estill Springs and Sewanee, Tenn.	1.50
Gray Summit and Klondike, Mo.	1.75@ 2.00
Los Angeles, Calif.—Washed	5.00
Mapleton Depot, Penn.	2.25@2.50
Massillon, Ohio	3.00
Mendota, Va.	2.25@ 2.50
Mineral Ridge and Ohlton, Ohio	2.50
Oceanside, Calif.	3.00
Ottawa, Ill.	.75@ 1.25
Pittsburgh, Penn.	3.00@ 4.00
Ridgway, Penn.	2.50
Rockwood, Mich.	2.75@ 3.25
Round Top, Md.	2.00
San Francisco, Calif.	4.00@ 5.00
Silica, Va.	2.25@ 2.50
St. Louis, Mo.	2.00
Sewanee, Tenn.	1.50
Thayers, Penn.	2.50
Utica, Ill.	.90
Zanesville, Ohio	2.50

Miscellaneous Sands

City or shipping point	Roofing sand	Traction
Beach City, Ohio		1.75
Columbus, Ohio	.30@ 1.50	1.50
Dresden, Ohio		1.25
Eau Claire, Wis.	4.25	.65@ 1.25
Estill Springs and Sewanee, Tenn.	1.35@ 1.50	1.35@ 1.50

(Continued on next page)

Wholesale Prices of Sand and Gravel

Prices given are per ton, F.O.B., producing plant or nearest shipping point

Washed Sand and Gravel

City or shipping point	Fine Sand, 1/10 in. down	Sand, ¼ in. and less	Gravel, ½ in. and less	Gravel, 1 in. and less	Gravel, 1½ in. and less	Gravel, 2 in and less
EASTERN:						
Ambridge & So. H'g'ts, Penn.	1.25	1.25	1.15	.85	.85	.85
Attica and Franklinville, N. Y.	.75	.75	.75	.75	.75	.75
Boston, Mass.	1.40	1.40	2.25		2.25	2.25
Buffalo, N. Y.	1.10	.95			.85	
Erie, Pa.		1.00*		1.50*	1.75*	
Farmingdale, N. J.		.48	.75	1.20	1.10	
Hartford, Conn.	.65*					
Leeds Junction, Me.		.50	1.75		1.35	1.25
Machias Jct., N. Y.	.75	.75	.85	.75	.75	.75
Montoursville, Penn.	1.00	1.00	1.00	.90	.90	.90
Northern New Jersey	.40@ .50	.40@ .50	1.25	1.25	1.25	
Portland, Me.	1.50	1.50	2.75		2.50	
Shining Point, Penn.			1.00	1.00	1.00	1.00
Somerset, Penn.		2.00				
South Heights, Penn.	1.25	1.25	.85	.85	.85	.85
Washington, D. C.	.85	.85	1.70	1.50	1.30	1.30
York, Penn.	1.10	1.00				
CENTRAL:						
Algonquin and Beloit, Wis.	.50	.40	.60	.60	.60	.60
Appleton and Mankato, Minn.		.45	1.25	1.25	1.25	1.25
Attica, Ind.			All sizes .75@.85			
Aurora, Oregon, Sheridan, Moronts, Yorkville, Ill.	.60	.50	.40	.50	.60	.55
Barton, Wis. (f)		.50		.75	.75	.75
Chicago district, Ill.	.70	.55	.55	.60	.60	.60
Columbus, Ohio	.70	.70	.70	.70		
Des Moines, Ia.		.30	1.40	1.40	1.50	1.50
Eau Claire, Wis.	.65@1.25	.45	.80	.95	.95	
Elkhart Lake, Wis.	.60	.50	.60	.60	.60	
Ferrysburg, Mich.		.50@ .80	.60@1.00	.60@1.00		.50@1.25
Ft. Dodge, Iowa	.85	.85	2.05	2.05	2.05	2.05
Grand Haven, Mich.		.60@ .70		.70@ .90		.70@ .90
Grand Rapids, Mich.	.50	.50		.80	.70	.70
Hamilton, Ohio		1.00			1.00	
Hersey, Mich.		.50				.70
Humboldt, Iowa	.50	.50	1.50	1.50	1.50	1.50
Indianapolis, Ind.	.60	.60		.90	.75@1.00	.75@1.00
Joliet, Plainfield and Hammond, Ill.	.60	.50	.50	.60	.60	.60
Mason City, Iowa	.50	.50	1.45	1.45	1.35	1.35
Mankato, Minn.		.45	1.25	1.25	1.25	1.25
Mattoon, Ill.	.75	.75	.75	.75	.75	.75
Milwaukee. Wis.		1.01	1.21	1.21	1.21	1.21
Moline, Ill.	.60@ .85	.60@ .85	1.00@1.20	1.00@1.20	1.00@1.20	1.00@1.20
Northern New Jersey	.40@ .60	.40@ .60	1.25	1.25	1.25	1.25
Pittsburgh, Penn.	1.25	1.25	.85	.85	.85	.85
Silverwood, Ind.	.75	.75	.75	.75	.75	.75
St. Louis, Mo.	.83	1.45	1.55	1.45	1.45	1.45
Terre Haute, Ind.	.75	.60	.75	.75	.75	.75
Wolcottville, Ind.	.75	.75	75	.75	.75	.75
Waukesha, Wis.		.45	.60	.60	.65	.65
Winona, Minn.	.40	.40	1.50	1.25	1.25	1.15
Zanesville, Ohio		.60	.50	.60	.80	
SOUTHERN:						
Charleston, W. Va.			All sand, 1.40.	All gravel, 1.40		
Brewster, Fla.	.60	.60	2.25g			
Chattahoochie River, Fla.		.70		1.75		
Eustis, Fla.		.60@ .70				
Ft. Worth, Texas	2.00	2.00	2.00	2.00	2.00	2.00
Knoxville, Tenn.	1.25	1.25		1.20	1.20	1.20
Lindsay, Texas					.55	
Macon, Ga.		.50		.90	.90	
New Martinsville, W. Va.	1.00	.90@1.00		1.20@1.30		.80@ .90
Roseland, La.	.50	.50	2.25	1.25	1.00	1.00
WESTERN:						
Kansas City, Mo.		.70				
Los Angeles, Calif.	.50	.50	1.10	1.10		1.10
Oregon City, Ore.		1.50*	1.50*	1.50*	1.50*	1.50*
Phoenix, Ariz.	1.25*	1.25*	2.50*	2.00*	1.75*	1.50*
Pueblo, Colo.	.80	.65		1.25		1.15
San Diego, Calif.	.65@ .75	.65@ .75	1.50	1.30	1.10	1.10
Seattle, Wash. (bunkers)	1.25*	1.25*	1.25*	1.25*	1.25*	1.25*

Bank Run Sand and Gravel

City or shipping point	Fine Sand, 1/10 in. down	Sand, ¼ in. and less	Gravel, ½ in. and less	Gravel, 1 in. and less	Gravel, 1½ in. and less	Gravel, 2 in. and less
Algonquin and Beloit, Wis.				Dust to 3 in., .40		
Chicago district, Ill.	.35					.65@1.00
Ferrysburg, Mich.						
East Hartford, Ohio	.75*					
Gainesville, Texas						.55
Grand Rapids, Mich.				.55		
Hamilton, Ohio					.70	
Hersey, Mich.				.50		
Indianapolis, Ind.			Mixed gravel for concrete work, at .65			
Joliet, Plainfield and Hammond, Ill.	.35	1.25				
Macon, Ga.	.40					
Moline, Ill. (b)	.60	.60	Concrete gravel, 50% G., 50% S., 1.00			
Ottawa, Oregon, Moronts and Yorkville, Ill.			Ave. .60 per ton all sizes			
Roseland, La.					.65	
Somerset, Penn.		1.85@2.00		1.50@1.75		
St. Louis, Mo.			Mine run gravel, 1.55 per ton			
Summit Grove, Ind.	.50	.50	.50	.50	.50	.54
Winona, Minn.	.40	.40	.60	.60	.60	.60
York, Penn.	1.10	1.00				

(a) ⅝ in. down. (b) River run. (c) 2½ in. and less.
*Cubic yd. †Include freight and bunkerage charges and truck haul. ‡Delivered on job.
(d) Less 10c per ton if paid E.O.M. 10 days. (e) pit run. (f) plus 15c winter loading charge. (g) ¾-in. and less.

Core and Foundry Sands

Silica sand is quoted washed, dried and screened unless otherwise stated. Prices per ton f.o.b. producing plant.

City or shipping point	Molding, fine	Molding, coarse	Molding, brass	Core	Furnace lining	Sand blast	Stone sawing
Aetna, Ill.				.30@ .35			
Albany, N. Y.	3.00	2.75	3.00	1.75		4.50	
Arenzville, Ill.	1.50@1.75			1.00			
Beach City, Iowa	2.00	2.00		1.75	2.00		
Buffalo, N. Y.	1.50	1.50		2.00@2.50			
Columbus, Ohio	1.25@2.00	1.25@1.75	2.00@2.50	.30@1.50	2.00@2.50	2.75@3.50	1.50@3.00
Dresden, Ohio	1.50@1.75	1.50	1.75	1.25			
Eau Claire, Wis.						3.00	
Elco, Ill.	Ground silica per ton in carloads—18.00@31.00						
Elnora, N. Y.			1.75				
Estill Springs and Sewanee, Tenn.	1.25			1.25		1.35@1.50	
Franklin, Penn.	1.75	1.75		2.00			
Klondike, Mo.	1.75@2.00		1.75@2.00	1.75@2.00	1.75@2.00		1.75
Mapleton Depot, Pa.	2.25			2.00	2.00	2.00	
Massillon, Ohio	2.25	2.25		2.25	2.50		
Mendota, Va.	Ground flint or silex—16.00@20.00 per ton						
Michigan City, Ind.				.30	.30		
Millville, N. J.				1.75b		3.50	
Montoursville, Penn.				1.25@1.50			
New Lexington, O.	2.75	2.25					
Ohlton, Ohio	1.80b	1.80b		2.00b	1.75b	1.75b	
Ottawa, Ill.			2.50	1.25	.75	3.50	3.00
Ridgeway, Penn.	1.50	1.50					
Round Top, Md.	1.25			1.60		2.25	
San Francisco, Calif.	3.50	4.75	3.50	3.50@5.00	3.50@4.50	3.50@5.00	
Silica, Va.				10.00@16.00			
Thayers, Penn.	1.25	1.25		2.00			
Utica, Ill.	.50@1.00	.50@1.00	.50@1.00	.55@ .90	.60@1.00	3.00@3.25	.90@3.25
Utica, Ill.	.65	.75		.75	.75		
Utica, Penn.	1.75	1.75		2.00			
Warwick, Ohio	*1.75@2.25	*1.75@2.25	2.25	*1.75@2.25	2.25		
Zanesville, Ohio	2.00‡	1.50‡	2.00‡	2.00	2.00		

*Green. †Crude silica, crushed and screened, not washed or dried. ‡Plus 75c per ton for winter loading. ¶Crude. §Crude and dry. (a) Delivered. (b) Damp.

Crushed Slag

City or shipping point	Roofing	¼ in. down	½ in. and less	¾ in. and less	1½ in and less	2½ in. and less	3 in. and larger
EASTERN:							
Buffalo, N. Y., Emporium and Dubois, Pa.	2.25	1.25	1.25	1.25	1.25	1.25	1.25
Eastern Penn.	2.50	1.20	1.50	1.20	1.20	1.20	1.20
Northern N. J.	2.50	1.20	1.50	1.20	1.20	1.20	1.20
Reading, Pa.	2.50	1.75		1.50			
Western Penn.	2.50	1.25	1.50	1.25	1.25	1.25	1.25
CENTRAL:							
Ironton, Ohio	2.05*	1.30*	1.75*	1.45*	1.30*	1.45*	1.45*
Jackson, Ohio		1.05*		1.30*	1.05*	1.30*	1.30*
Toledo, Ohio	1.50	1.35	1.35	1.35	1.35	1.35	1.35
Youngst'n, O., dist.	2.00	1.25	1.35	1.35	1.25	1.25	1.25
SOUTHERN:							
Ashland, Ky.		1.55*		1.55*	1.55*	1.55*	1.55*
Ensley and Alabama City, Ala.	2.05	.80	1.35	1.25	.90	.90	.80
Longdale, Roanoke, Ruessens, Va.	2.50	1.00	1.25	1.25	1.25	1.15	1.15
Woodward, Ala.	2.05*	.80*	1.35*	1.25*	.90*	.90*	

*5c per ton discount on terms.

Lime Products (Carload Prices Per Ton F.O.B. Shipping Point)

	Finishing hydrate	Masons' hydrate	Agricultural hydrate	Chemical hydrate	Ground burnt lime, Blk.	Ground burnt lime, Bags	Lump lime, Blk.	Lump lime, Bbl.
EASTERN:								
Berkeley, R. I.			12.00					2.15e
Buffalo, N. Y.		12.00	12.00	12.00			10.00	1.95d
Chazy, N. Y.	12.50	10.50	8.00	12.00	11.50	16.50	10.00	2.50z
Lime Ridge, Penn.					5.00a			
West Stockbridge, Mass.	12.00	10.00	5.60					2.00t
Williamsport, Penn.			10.00				6.00	
York, Penn.		9.50	9.50	10.50	8.50	10.50	8.50	1.65i
CENTRAL:								
Afton, Mich.							8.50	1.35
Carey, Ohio	12.50	8.50	8.00		9.00		8.00	2.00
Cold Springs, Ohio		8.50	8.50				8.00	
Delaware, Ohio		8.50	8.50	9.00			7.50	1.50c
Frederick, Md.		10.00	10.00	10.00	8.50	10.00	7.00	
Gibsonburg, Ohio	12.50	8.50	8.50		9.00	11.00	8.00	
Huntington, Ind.	12.50	8.50	8.50		9.00		8.00	
Luckey, Ohio	12.50							
Marblehead, Ohio		8.50	8.50		9.00		8.00	1.50w
Marion, Ohio		8.50	.850				8.00	1.70d
Milltown, Ind.		9.00@10.00		10.00p			8.50q	1.40r
Sheboygan, Wis.	11.50						9.50	.95
Tiffin, Ohio					9.00			
White Rock, Ohio	12.50				9.00	11.00	8.00	
Wisconsin points (f)		11.50					9.50	
Woodville, Ohio	12.50	8.50	8.50	13.50	9.00	11.00	9.00	1.50
SOUTHERN:								
Allgood, Ala.	12.50	10.00			8.50		8.50	1.50
El Paso, Texas							8.50	1.50
Graystone, Ala.	12.50	10.00					8.50	1.50
Keystone, Ala.		10.00	10.00	10.00	8.50			1.50
Knoxville, Tenn.	20.00	10.00	9.00	9.00	8.50	1.35	8.00	1.50
Longview, Ala.	12.50	10.00	9.00	10.00			8.50	1.50
New Braunfels, Tex.	18.00	12.00	10.00	12.00	10.00		9.50	
Ocala, Fla.	14.00	13.00	12.00	13.00			12.00	1.70
Saginaw, Ala.	12.50	10.00	9.00	10.00			8.50	1.50
WESTERN:								
Kirtland, N. M.							15.00	
Limestone, Wash.	15.00	15.00	10.00	15.00	16.50	16.50	16.50	2.09
Dittlinger, Tex.		12.00@13.00					9.50p	1.50,
San Francisco, Calif.	21.00	19.00	16.50				14.00	2.00
Tehachapi, Calif.			8.00				13.00z	2.20x
Seattle, Wash.	19.00	19.00	12.00	19.00	19.00		18.60	2.30

†50-lb. paper bags; (a) run of kilns; (c) wooden, steel 1.70; (d) steel; (e) per 180-lb. barrel; (f) dealers' prices, net 30 days less 25c disc. per ton on hydrated lime and 5c per bbl. on lump if paid in 10 days; (i) 180-lb. net barrel, 1.65; 280-lb. net barrel, 2.65; (p) to 11.00; (q) to 8.75; (r) to 1.50; (s) in 80-lb. burlap sacks; (t) to 3.00; (u) two 90-lb. bags; (v) oil burnt; wood burnt 2.25@2.50; (x) wood, steel 2.30; (z) to 15.00; (*) quoted f.o.b. New York; (‡) paper bags; (w) to 1.50 in two 90-lb. bags, wood bbl. 1.60; (1) to 10.00; (3) 80-lb. paper bags; (2) to 3.00; (3) to 9.00; (4) to 1.60. (5) to 16.00; (6) wood bbl., steel, 1.80.

Miscellaneous Sands

(Continued)

City or shipping point	Roofing sand	Traction
Mapleton Depot, Penn.		2.00@ 2.25
Massillon, Ohio		2.25
Michigan City, Ind. (Engine sand)		.15@ .25
Mineral Ridge, Ohio	*1.75@ 2.00	*1.75
Montoursville, Penn.		1.25
Ohlton, Ohio	1.80	1.80
Ottawa, Ill.	1.25	1.25
Red Wing, Minn.		1.25
Round Top, Md.	2.25	1.75
San Francisco, Calif.	3.50@ 4.50	3.50@ 4.50
Thayers, Penn.		2.25
Utica, Ill.	.90@ 3.25	.90
Warwick, Ohio	2.25	2.25
Zanesville, Ohio		2.50

*Wet.

Talc

Prices given are per ton f.o.b. (in carload lots only), producing plant, or nearest shipping point.

Baltimore, Md.:	
Crude talc (mine run)	3.00@ 4.00
Ground talc (20-50 mesh), bags	10.00
Cubes	55.00
Blanks (per lb.)	.08
Pencils and steel worker's crayons, per gross	.08
	1.00@ 1.50
Chatsworth, Ga.:	
Crude Talc	5.00
Ground (150-200 mesh), bulk	10.00
Pencils and steel worker's crayons, per gross	1.00@ 2.00
Chester, Vt.:	
Ground talc (150-200 mesh), bulk	9.00@10.00
Including bags	10.00@11.00
Chicago and Joliet, Ill.:	
Ground (150-200 mesh), bags	30.00
Dalton, Ga.:	
Crude talc	5.00
Ground talc (150-200) bags	10.00@12.00
Pencils and steel workers' crayons, per gross	1.00@ 1.50
Emeryville, N. Y.:	
(Double air floated) including bags;	
325 mesh	14.75
200 mesh	13.75
Hailesboro, N. Y.:	
Ground white talc (double and triple air floated) including bags, 300-350 mesh	15.50@20.00
Henry, Va.:	
Crude (mine run)	3.50@ 4.00
Ground talc (150-200 mesh), bulk	7.75@14.00
Joliet, Ill.:	
Roofing talc, bags	12.00
Ground talc (200 mesh), bags	30.00
Keeler, Calif.:	
Ground (200-300 mesh), bags	20.00@30.00
Natural Bridge, N. Y.:	
Ground talc (125-200 mesh), bags	10.00@15.00

Rock Phosphate

Prices given are per ton (2240-lb.) f.o.b. producing plant or nearest shipping point.

Lump Rock

Gordonsburg, Tenn.—B.P.L. 68-72%	3,75@ 4.25
Mt. Pleasant, Tenn.—B.P.L. 75%	5.50@ 6.00
Tennessee—F.O.B. mines, gross ton, unground brown rock, B.P.L. 72%	5.00
B.P.L. 75%	6.00
Twomey, Tenn.—B.P.L. 65%, 2000 lb.	8.00@ 9.00

Ground Rock

(2000 lbs.)

Centerville, Tenn.—B.P.L. 65%	7.00
Gordonsburg, Tenn.—B.P.L. 68-72%	4.00@ 5.00
Mt. Pleasant, Tenn.—B.P.L. 72%	5.00@ 5.50
Twomey, Tenn.—B.P.L. 65%	8.00@ 9.00

Florida Phosphate

(Raw Land Pebble)

(Per Ton.)

Florida—F. O. B. mines, gross ton, 68/66% B.P.L., Basis 68%	3.25
70% min. B.P.L., Basis 70%	3.75

Mica

Prices given are net, F.O.B. plant or nearest shipping point.

Franklin, N. C.—	
Mine scrap, per ton	12.00
Clean shop scrap, per ton	16.00
Punch mica, per lb.	.05
Pringle, S. D.—Mine run, per ton	125.00
Punch mica, per lb.	.06
Scrap, per ton, carloads	20.00
Rumney Depot, N. H.—per ton,	
Mine run	360.00
Clean shop scrap	25.00
Mine scrap	22.00
20 mesh	32.00
60 mesh	45.00
100 mesh	60.00
Roofing mica	36.00
Punch mica, per lb.	.12

Special Aggregates

Prices are per ton f.o.b. quarry or nearest shipping point.

City or shipping point	Terrazzo	Stucco-chips
Barton, Wis., f.o.b. cars	.....	10.50
Brandon, Vt.—English pink, English cream and coral pink	*11.00	*11.00
Brandon grey	*11.00	*11.00
Brighton, Tenn.—Pink	6.00	5.00
Mixed pink and bronze	4.50@ 6.00	4.50@ 6.00
All colors, mixed sizes	3.50	3.50
Buckingham, Que.—Buff stucco dash	.....	12.00@14.00
Chicago, Ill. — Stucco chips, in sacks f.o.b. quarries	.....	17.50
Crown Point, N. Y.—Mica Spar	.....	8.00@10.00
Dayton, Ohio	.....	6.00@24.00
Easton, Penn., and Phillipsburg, N. J.	12.00@16.00	12.00@16.00
Haddam, Conn. — Felstone buff	15.00	15.00
Harrisonburg, Va.—Bulk marble (crushed, in bags)	†12.50	†12.50
Ingomar, Ohio — Concrete facings and stucco dash	.....	6.00@18.00
Middlebrook, Mo.—Red	.....	25.00@30.00
Middlebury, Vt.—Middlebury white	‡9.00	‡9.00
Middlebury and Brandon, Vt.—Caststone, per ton, including bags	.....	5.50
Milwaukee, Wis.	.....	14.00@34.00
Newark, N. J.—Roofing granules	.....	7.50
New York, N. Y.—Red and yellow Verona	.....	32.00
Red Granite, Wis.	.....	7.50
Stockton, Calif. — "Natrock" roofing grits	.....	12.00@15.00
Tuckahoe, N. Y.—Tuckahoe white	12.00	.....
Wauwatosa, Wis.	.....	22.00@32.00
Wellsville, Colo.—Colorado Travertine Stone	15.00	15.00

†C.L. L.C.L. 17.00.
*C.L. including bags; L.C.L. 14.50
‡C.L. including bags, L.C.L. 10.00.

Potash Feldspar

Auburn and Brunswick, Me.—Color, white; 98% thru 140 mesh bulk	19.00
Buckingham, Que.—Color, white; analysis, K_2O, 12-13%; Na_2O, 1.75%; bulk	9.00
De Kalb Jct., N. Y.—Color, white; bulk (crude)	9.00
East Hartford, Conn.—Color, white, 95% through 60 mesh, bags	16.00
96% thru 150 mesh, bags	30.00
East Liverpool, Ohio—Color, white; 98% thru 200 mesh, bulk	19.35
Soda feldspar, crude, bulk, per ton	22.00
Erwin, Tenn.—Color, white; analysis, 12.07% K_2O, 19.34% Al_2O_3; Na_2O, 2.92%; SiO_2, 64.76%; Fe_2O_3, .36%; 98.50% thru 200 mesh, bags, 16.90; bulk	15.50
Glen Tay Station, Ont., color, red or pink; analysis: K_2O, 12.81%, crude (bulk)	7.00
Keystone, S. D.—Prime white, bulk (crude)	8.00
Los Angeles, Calif. — Color, white; analysis, K_2O, 12.16; Na_2O, 1.53; SiO_2, 65.60; Fe_2O_3, .10; Al_2O_3, 19.20; crude	10.05@11.55
Pulverized, 95% thru 200 mesh; bags, 22.00@23.50; bulk	20.00
Murphysboro, Ill.—Color, prime white; analysis, K_2O, 12.60%; Na_2O, 2.35%; SiO_2, 63%; Fe_2O_3, .06%; Al_2O_3, 18.20%; 98% thru 200 mesh; bags, 21.00; bulk	20.00
Penland, N. C.—Color, white; crude, bulk	8.00
Ground, bulk	16.50
Spruce Point, N. C., and Bristol, Tenn.—Color, white; 90% thru 200 mesh, bulk	12.50@20.00
Tenn. Mills—Color, white; analysis K_2O, 18%; Na_2O_3, 10%; 65% SiO_2; 99% thru 200 mesh; bulk	18.00
99% thru 140 mesh, bulk	16.00
Topsham, Me.—98% thru 140 mesh, bulk	19.00
Toronto, Can.—Color, flesh; analysis K_2O, 12.75%; Na_2O, 1.96%; crude	7.50@ 8.00

Blended Feldspar
(Pulverized)

Tenn. Mills—Bulk ..... 16.00@20.00

Chicken Grits

Afton Mich. (limestone) per ton	10.00
Belfast and Rockland, Me.—(Limestone), bags, per ton	‡10.00
Brandon and Middlebury, Vt., per ton	10.00
Cartersville, Ga.—(Limestone), per bag	2.00
Centerville, Iowa (gypsum) per ton	18.00
Chico, Texas (limestone), 100 lb. bags, per ton	8.00@ 9.00
Danbury, Conn. (limestone)	7.00@ 9.00
Easton, Penn.—Per ton, bulk	3.00
Joliet, Ill.—(Limestone), bags, per ton	4.50
Knoxville, Tenn.—per bag	1.00
Los Angeles, Calif. (feldspar) per ton	17.85
Gypsum, Ohio.—(Gypsum) per ton	10.00
Limestone, Wash. (limestone) per ton	12.50
Rocky Point, Va. (limestone) 100 lb. bags, 50c; sacks, per ton, 6.00 bulk	5.00
Seattle, Wash.—(Limestone), bulk, per ton	12.00
Warren, N. H.—(Mica) per ton	7.70@7.90‡
Waukesha, Wis.—(Limestone), per ton	8.00
West Stockbridge, Mass.—(Limestone) bulk	7.50@9.00*

*L.C.L.
†Less than 5-ton lots.
‡C.L.

Sand-Lime Brick

Prices given per 1000 brick f.o.b. plant or nearest shipping point, unless otherwise noted.

Barton, Wis.	10.50
Boston, Mass.	*17.00
Brighton, N. Y.	*19.75
Dayton, Ohio	12.00@13.50
Detroit, Mich.	13.50@15.00
Farmington, Conn.	13.00
Flint, Mich.	¶12.50@16.00
Grand Rapids, Mich.	12.00
Hartford, Conn.	*19.00
Jackson, Mich.	13.00
Lake Helen, Fla.	10.00@15.00
Lancaster, N. Y.	12.50
Madison, Wis.	a12.50
Michigan City, Ind.	11.00
Milwaukee, Wis.	*13.00
Minneapolis and St. Paul, Minn.	13.00
Minnesota Transfer	10.00
New Brighton, Minn.	10.00
Pontiac, Mich.	12.00@13.50
Portage, Wis.	15.00
Prairie du Chien, Wis.	18.00@22.50
Rochester, N. Y.	*19.75
Saginaw, Mich.	13.00
San Antonio, Texas	16.00
Sebewaing, Mich.	12.00
Syracuse, N. Y.	16.00@18.00*
Toronto, Canada	15.60†
Toronto, Canada	13.10
Wilkinson, Fla.	10.00@12.00

*Delivered on job. †Sales tax included.
‡Less 5%. ¶Dealers' price. (a) Less .50 E.O.M. 10 days.

Portland Cement

Prices per bag and per bbl, without bags net in carload lots.

	Per Bag	Per Bbl.
Albuquerque, N. M.	.86¾	3.47
Atlanta, Ga.	.....	2.35
Baltimore, Md.	.....	2.25
Birmingham, Ala.	.....	2.30
Boston, Mass.	.....	2.53
Buffalo, N. Y.	.....	2.38
Butte, Mont.	.90¼	3.61
Cedar Rapids, Iowa	.....	2.24‡
Charleston, S. C.	.....	2.35
Cheyenne, Wyo.	.82¾	3.31
Cincinnati, Ohio	56¾	2.37‡
Cleveland, Ohio	.....	2.29‡
Chicago, Ill.	.....	2.10‡
Columbus, Ohio	.....	2.34
Dallas, Texas	.....	2.10
Davenport, Iowa	.....	2.29‡
Dayton, Ohio	.....	2.38
Denver, Colo.	.66¼	2.65
Detroit, Mich.	.....	2.15
Duluth, Minn.	.....	2.09‡
Houston, Texas	.....	2.60
Indianapolis, Ind.	.....	2.29‡
Jackson, Miss.	.....	2.60
Jacksonville, Fla.	.....	2.20
Jersey City, N. J.	.....	2.23
Kansas City, Mo.	.....	1.92
Los Angeles, Calif.	.59½	2.44†
Louisville, Ky.	.54¼	.....
Memphis, Tenn.	.....	2.60
Milwaukee, Wis.	.....	2.25‡
Minneapolis, Minn.	.....	2.22‡
Montreal, Que.	.....	1.36
New Orleans, La.	.....	2.20
New York, N. Y.	.....	2.15
Norfolk, Va.	.....	2.17
Oklahoma City, Okla.	.....	2.46
Omaha, Neb.	.....	2.36
Peoria, Ill.	.....	2.27‡
Philadelphia, Penn.	.....	2.31
Phoenix, Ariz.	.81½	3.26
Pittsburgh, Penn.	.....	2.09‡
Portland, Colo.	.....	2.80
Portland, Ore.	.....	2.60
Reno, Nevada	.....	2.91
Richmond, Va.	.....	2.44
Salt Lake City, Utah	.70¼	2.81
San Francisco, Calif.	.....	2.31
Savannah, Ga.	.....	2.50
St. Louis, Mo.	.55	2.20
St. Paul, Minn.	.....	2.22‡
Seattle, Wash.	.....	2.65
Tampa, Fla.	.....	2.25
Toledo, Ohio	.....	2.20‡
Topeka, Kans.	.....	2.41
Tulsa, Okla.	.....	2.33
Wheeling, W. Va.	.....	2.17
Winston-Salem, N. C.	.....	2.78

NOTE—Add 40c per bbl. for bags.
†Delivered on job in any quantity, sacks extra.
‡Ten cents discount for cash, 15 days.

Mill prices f.o.b. in carload lots, without bags to contractors.

	Per Bag	Per Bbl.
Buffington, Ind.	.....	1.85
Chattanooga, Tenn.	.....	2.45*
Concrete, Wash.	.....	2.35
Davenport, Calif.	.....	2.05
Detroit, Mich.	.....	2.15
Hannibal, Mo.	.....	1.85
Hudson, N. Y.	.....	1.95
Leeds, Ala.	.....	1.95
Mildred, Kans.	.....	2.35
Nazareth, Penn.	.....	1.95
Northampton, Penn.	.....	1.85
Richard City, Tenn.	.....	2.05
Steelton, Minn.	.....	1.90
Toledo, Ohio	.....	2.20
Universal, Penn.	.....	1.85

*Including sacks at 10c each.

Gypsum Products—CARLOAD PRICES PER TON AND PER M SQUARE FEET, F. O. B. MILL

	Crushed Rock	Ground Gypsum	Agricultural Gypsum	Stucco Calcined Gypsum	Cement and Gauging Plaster	Wood Fiber	White Gauging	Sanded Plaster	Keene's Cement	Trowel Finish	—Plaster Board— ⅜x32x 36". Wt. 1500 lb. Per M Sq. Ft.	½x32x 36". Wt. 1850 lb. Per M Sq. Ft.	Wallboard, ⅜x32 or 48". Lgths. 6'-10', 1850 lb. Per M Sq. Ft.
Arden, Nev. and Los Angeles, Calif.	3.00	8.00u	8.00u	10.70u	10.70u	.....	.....	.....	.....	11.70u	.....	.....	.....
Centerville, Iowa	3.00	10.00	15.00	10.00	10.00	10.50	13.50	.....	.....	13.50	.....	.....	.....
Des Moines, Ia.	3.00	8.00	9.00	10.00	10.00	10.50	13.50	12.00	24.00	22.00	18.00	21.00	30.00
Detroit, Mich.	.....	.....	.....	.....	14.30o	12.30m	.....	m9.00@11.00o	.....	.....	.....	.....	.....
Delawanna, N. J.	.....	.....	.....	.....	.....	8.00	.....	8.25@9.40	.....	.....	.14½s	.15½s	40.00@41.00
Douglas, Ariz.	.....	.....	7.00	.....	.....	15.50d	18.50	.....	30.00	15.50	.....	.....	.....
Grand Rapids, Mich.	2.75	6.00	6.00	8.00	9.00	9.00	17.50	.....	24.55	20.00	.....	.....	.....
Gypsum, Ohio†	3.00	4.00	6.00	7.00	9.00	9.00	19.00	7.00	25.00	20.00	.....	15.00	30.00
Los Angeles, Calif.	.....	.....	.....	8.50	.....	.....	.....	.....	.....	.....	.....	.....	.....
Port Clinton, Ohio	3.00	4.00	6.00	10.00	9.00	9.00	21.00	7.00	30.15	20.00	.....	20.00	30.00
Portland, Colo.	.....	.....	.....	10.00	.....	.....	.....	.....	.....	.....	.....	.....	.....
San Francisco, Calif.	.....	.....	11.65m	13.40r	14.40r	.....	15.40r	.....	.....	.....	.....	.....	.....
Seattle, Wash.	6.50	11.00	11.00	15.00@16.00	.....	.....	.....	.....	.....	.....	.....	.....	.....
Sigurd, Utah	.....	.....	.....	.....	.....	.....	.....	.....	21.50	.....	.....	.....	.....
Winnipeg, Man.	5.00	5.00	7.00	13.00	14.00	14.00	.....	.....	.....	.....	20.00	25.00	33.00

NOTE—Returnable bags, 10c each; paper bags, 1.00 per ton extra (not returnable).
*To 3.00; †to 11.00; ‖to 12.00; ‡prices per net ton, sacks extra; (a) to 25.00; (b) net; (c) gross; (d) hair fibre; (e) delivered; (h) delivered in six states; (i) delivered on job; (k) sacks 12c extra, rebated; (m) includes paper bags; (o) includes jute sacks; (r) including sacks at 15c; (s) per board; (t) to 16.50; (u) includes sacks; (v) F.O.B. N. Y. C. and dealers yard in mill locality.

Market Prices of Cement Products

Concrete Block

Prices given are net per unit, f.o.b. plant or nearest shipping point

City of shipping point	Sizes 8x8x16	8x10x16	8x12x16
Camden, N. J.	17.00	.....	.....
Cement City, Mich.		5x8x12—55.00¶	
Columbus, Ohio	.16@.18a	.....	.....
Detroit, Mich.	.16	.....	.18
Forest Park, Ill.	18.00*	23.00*	30.00*
Grand Rapids, Mich.	.15	.....	.....
Graettinger, Iowa	.18@.20	.....	.....
Indianapolis, Ind.	.13@.15†	.....	.....
Los Angeles, Calif.¶	5¾x3½x12—55.00	7¾x3½x12—65.00	
Oak Park, Ill.	18.00@40.00¶	.....	.....
Olivia and Mankato, Minn.	9.50b	.....	.....
Somerset, Penn.	.20@.25	.....	.....
Tiskilwa, Ill.	.16@.18†	.....	.....
Yakima, Wash.	20.00*	.....	.....

*Price per 100 at plant. †Rock or panel face. (a) Face. ‡Delivered. ¶Price per 1000. (b) Per ton.

Cement Roofing Tile

Prices are net per sq. in carload lots, f.o.b. nearest shipping point unless otherwise stated.

Camden and Trenton, N. J.—8x12, per sq.

Red	15.00
Green	18.00

Chicago, Ill.—per sq. 20.00

Cicero, Ill.—Hawthorne roofing tile, per sq.

	Chocolate, Red and Orange	Green Blue
French and Spanish†	$11.50	$13.50
Ridges (each)	.25	.35
Hips	.25	.35
Hip starters	.50	.60
Hip terminals, 2-way	1.25	1.50
Hip terminals, 4-way	4.00	5.00
Mansard terminals	2.50	3.00
Gable finials	1.25	1.50
Gable starters	.25	.35
Gable finishers	.25	.35
*End bands	.25	.35
*Eave closers	.06	.08
*Ridge closers	.05	.06

*Used only with Spanish tile.
†Price per square.

Houston, Texas.—Roofing Tile, per sq. 25.00

Indianapolis, Ind.—9x15-in. Per sq.

Gray	10.00
Red	11.00
Green	13.00

Waco, Texas: Per sq.

4x4	.60

Cement Building Tile

Cement City, Mich	Per 1000
5x8x12	55.00
Detroit, Mich.	Per 100
5x4x12	4.50
5x8x12	8.00
Longview, Wash.	Per 1000
4x6x12	52.00
4x8x12	64.00
Mt. Pleasant, N. Y.:	Per 1000
5x8x12	78.00
Grand Rapids, Mich.:	Per 1000
5x8x12	70.00
Houston, Texas:	
5x8x12 (Lightweight)	80.00
Pasadena, Calif. (Stone-Tile)	Per 100
3½x4x12	3.00
3½x6x12	4.50
3½x8x12	6.00
Tiskilwa, Ill.—8x8, per 100	15.00
Wildasin Spur, Los Angeles, Calif.	(Stone-Tile)
	Per 1000
3½x6x12	50.00
3½x8x12	60.00
Prairie du Chien, Wis.	14.00 22.50@27.00
Yakima, Wash.—Building tile:	
5x8x12	.10

Cement Drain Tile

Graettinger, Iowa—5 to 36 in., per ton	8.00
Olivia and Mankato, Minn.—Cement drain tile, per ton	8.00
Tacoma, Wash.—Drain tile per ft.:	
3 in.	.04
4 in.	.05
6 in.	.07½
8 in.	.10
Waukesha, Wis.—Drain tile, per ton	9.00

Concrete Brick

Prices given per 1000 brick, f.o.b. plant or nearest shipping point.

	Common	Face
Appleton, Minn.	22.00	30.00@35.00
Baltimore, Md. (Del. according to quantity)	15.50	22.00@50.00
Camden and Trenton, N. J.	17.00	
Ensley, Ala. ("Slagtex")	14.50	22.50@33.50
Eugene, Ore.	25.00	35.00@75.00
Friesland, Wis.	22.00	32.00
Longview, Wash.	18.00	25.00@75.00
Milwaukee, Wis.	15.00	25.00@75.00
Mt. Pleasant, N. Y.		14.00@23.00
Omaha, Neb.	18.00	30.00@40.00
Pasadena, Calif.	11.00	.....
Philadelphia, Penn.	15.00	20.00
Portland, Ore.	17.00	25.00@55.00
Prairie du Chien, Wis.	14.00	23.00
Rapid City, S. D.	18.00	25.00@80.00
Waco, Texas	16.50	32.50@125.00
Watertown, N. Y.	20.00	35.00
Wauwatosa, Wis.	14.00	21.00@42.00
Westmoreland Wharves, Penn.	15.00	20.00
Winnipeg, Man.	14.00	22.00
Yakima, Wash.	22.50	.....

†Gray. ‡Red.

Current Prices Cement Pipe

Prices are net per foot f.o.b. cities or nearest shipping point in carload lots unless otherwise noted.

Culvert and Sewer	4 in.	6 in.	8 in.	10 in.	12 in.	15 in.	18 in.	20 in.	22 in.	24 in.	27 in.	30 in.	36 in.	42 in.	48 in.	54 in.	60 in.
Detroit, Mich.								15.00 per ton									
Graettinger, Iowa	.04½d	.05½	.08½	.12½	.17½	.....	.40	.50	.60	.70	.....	.....	.....	.....	.....	.....	.....
G'd Rapids, Mich. (b)	.....	.....	.....	.60	.72	1.00	1.28	.....	.....	1.92	2.32	3.00	4.00	5.00	6.00	.....	.....
Houston, Texas	.....	.19	.28	.43	.55½	.90	1.30	.....	†1.70	2.20	.....	.....	.....	.....	.....	.....	.....
Indianapolis, Ind. (a)	.....	.....	.....	.80	.90	1.10	1.30	.....	.....	1.70	.....	2.70	.....	.....	.....	.....	.....
Longview, Wash.								Sewer pipe 40% off list, culvert—list									
Mankato, Minn. (b)	.....	.....	.....	.....	.....	.....	.....	.....	.....	1.50	1.75	2.50	3.25	4.25	.....	.....	.....
Newark, N. J.								6 in. to 24 in., $18.00 per ton									
Norfolk, Neb.	.....	.....	.....	.90	1.00	1.13	1.42	.....	.....	2.11	.....	2.75	3.58	.....	6.14	.....	7.78
Olivia, Mankato, Minn.								12.00 per ton									
Paullina, Iowa‡	.....	.....	.....	.....	.....	.....	.....	2.25	.....	2.11	.....	2.75	3.58	.....	6.14	.....	7.78
Somerset, Penn.	.....	.....	.....	.....	1.08	1.25	1.65	.....	.....	2.50	.....	3.65	4.85	7.50	8.50	.....	.....
Tacoma, Wash.	.15	.18	.22	.30	.40	.60	.75	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Tiskilwa, Ill. (rein.) (a)	.....	.....	.....	.65	.75	.85	1.10	1.60	.....	1.90	.....	2.25	3.40	.....	5.50	.....	.....
Wahoo, Neb. (b)	.....	.....	.....	.....	1.00	1.13	1.42	.....	.....	2.11	.....	2.75	3.58	4.62	6.14	6.96	7.78
Waukesha, Wis.								12 in. to 60 in. 18.00 per ton									
Yakima, Wash.								$10.00 per ton									

*30-in. lengths up to 27-in. diam., 48-in. lengths after; (a) 24-in. lengths; (b) Reinforced; (c) Interlocking bar reinforced.
†21-in. diam. ‡Price per 2 ft. length. (d) 5 in. diam. [1]@1.08 [2]@1.25. [3]@1.65. [4]@2.50. [5]@3.85. [6]@5.00. [7]@7.50.

Portland Companies Bid on Sand and Gravel

TWO proposals were offered for furnishing sand and gravel to the city of Portland, Ore., recently. The Columbia Contract Co. bid as follows: Concrete, muck and mason sand, 95 cents per cu. yd.; concrete gravel, $1.10 per cu. yd.; 2-in. gravel, $1.10, and fill material, 40 cents per cu. in.

Porter W. Yett, concrete, muck and mason sand, $1 per cu. yd.; 2-in. gravel, $1 per cu. yd.; 1-in. gravel, $1 per cu. yd., and fill material, 75 cents.—*Portland (Ore.) Journal of Commerce.*

Cement Burial Vault Company Building Addition to Plant

A RECENT item in the Green Bay (Wis.) *Press Gazette* states that the National Vault Co., 1302 S. Webster Ave., that city, has a new building under construction in the rear of the present plant which is designed to be of a hundred-vault capacity, and will take care of the company's constantly increasing business.

The National Vault Company has been in business, manufacturing cement burial vaults, for three years. William Knuth is owner and manager. In addition to vaults, the company manufactures various sorts of benches, bird baths, and cement monuments of all kinds for use on cemetery lots.

Cement vaults, Mr. Knuth declares, are coming more and more into use, not only because of their indestructibility, but also because of their waterproof quality. Moreover, tests made have proved that the cement vault will stand an enormous amount of weight or pressure.

Celite Company Consolidates With Feather-Stone

ACCORDING to news reports from California, the Celite Products Co. of Lompoc, Calif., has purchased the interests and property of the Feather-stone Insulation Co. of Covina. These two companies have been rivals in the field and the consolidation removes competition.

The stone deposits owned by both companies, it is said, are practically identical in character, and it is therefore planned to keep both plants in operation in the future as in the past.

Cement Products

Large Ohio Plant Built After Thorough Testing of Materials

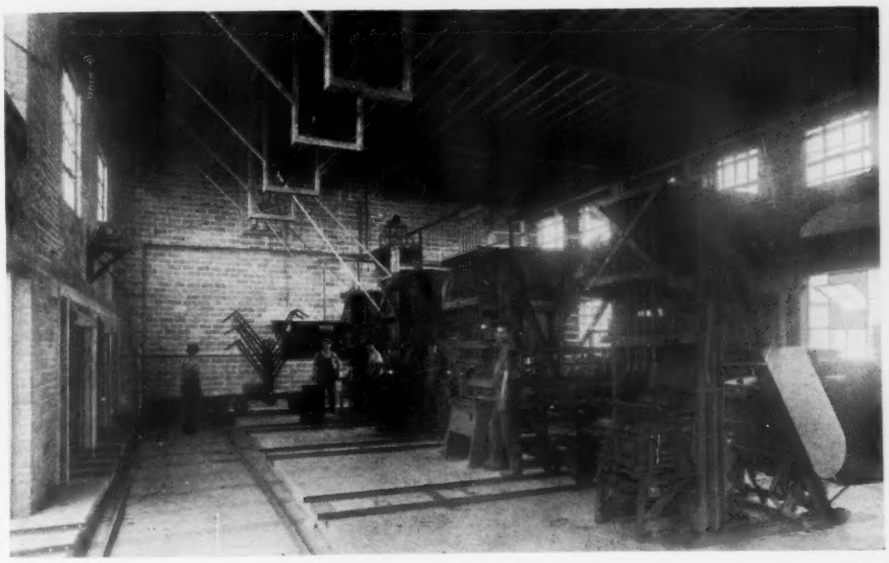
ONE of the largest cement products plants between Cleveland and Detroit was put in operation recently by the Lorain Crystal Ice Co. at Lorain, Ohio. In selecting the location of the plant the sources and quality of aggregate were taken into consideration and with this in view a temporary set-up was erected on the site to test out the aggregate before any permanent buildings were put up. The block made at the temporary plant, using sand from a pit on the location and slag from the nearby blast furnaces of the National Tube Co., gave such satisfactory results that the company felt justified in carrying out its plans for the present plant.

New cement products plant recently put in operation at Lorain, Ohio, by the Lorain Crystal Ice Co.

Raw materials, such as cement, in carloads are received on a railroad siding running along the warehouse and unloaded direct into the particular rooms desired. Sand and slag are dumped into a pit underneath the track and from there are carried by an endless belt conveyor to bins placed directly over the mixer. All operations are carried out in one large rom, the mixing room. This, however, is interconnected with the machine room, which shows at the left in the exterior view, and the supply warehouse at the right. There are three steam curing curing tunnels leading from the machine room. These are shown at the left in the view of the interior.

The present installation consists of four Anchor units, including a stripper, brick, back-up tile and face down machine. The daily capacity with this arrangement is about 1500 plain face brick, 3000 back-up tile, 10,000 brick and 600 rock or panel face block. A monorail system is used to feed the machines from the 14-ft. Blystone mixer. The system handles the dump bucket above the machines and furnishes the concrete mix to the different machines as required. The entire installation is operated by electric power.

The officers of the Lorain Crystal Ice Co. are: William Seher, president; John G. Dorr, vice-president; A. Kuebeler, Jr., secretary; E. A. Braun, treasurer, and A. A. Plato, general manager. Paul L. Plato is the general manager of the cement products plant. The general office is located at First street and Oberlin avenue, Lorain.



Interior of the plant showing the block machines and the entrance to the steam curing rooms

Making Centrifugal Concrete Pipe in Canada

The Consolidated Pipe Co., Ltd., Montreal, Que., was organized in April, 1926, to operate in Canada, using the Moir-Buchanan and the Stac or Caron patents for making concrete pipes by the centrifugal process. An initial plant, to serve the province of Quebec and vicinity, has been erected at Cote-St.-Luc on the outskirts of Montreal, and has been in operation since September, making sizes of sewer pipes from 4 to 36 in. in diameter.

The company is operating its two groups of patents in conjunction; but, generally speaking, makes its smaller sizes by the Caron process which is purely centrifugal,

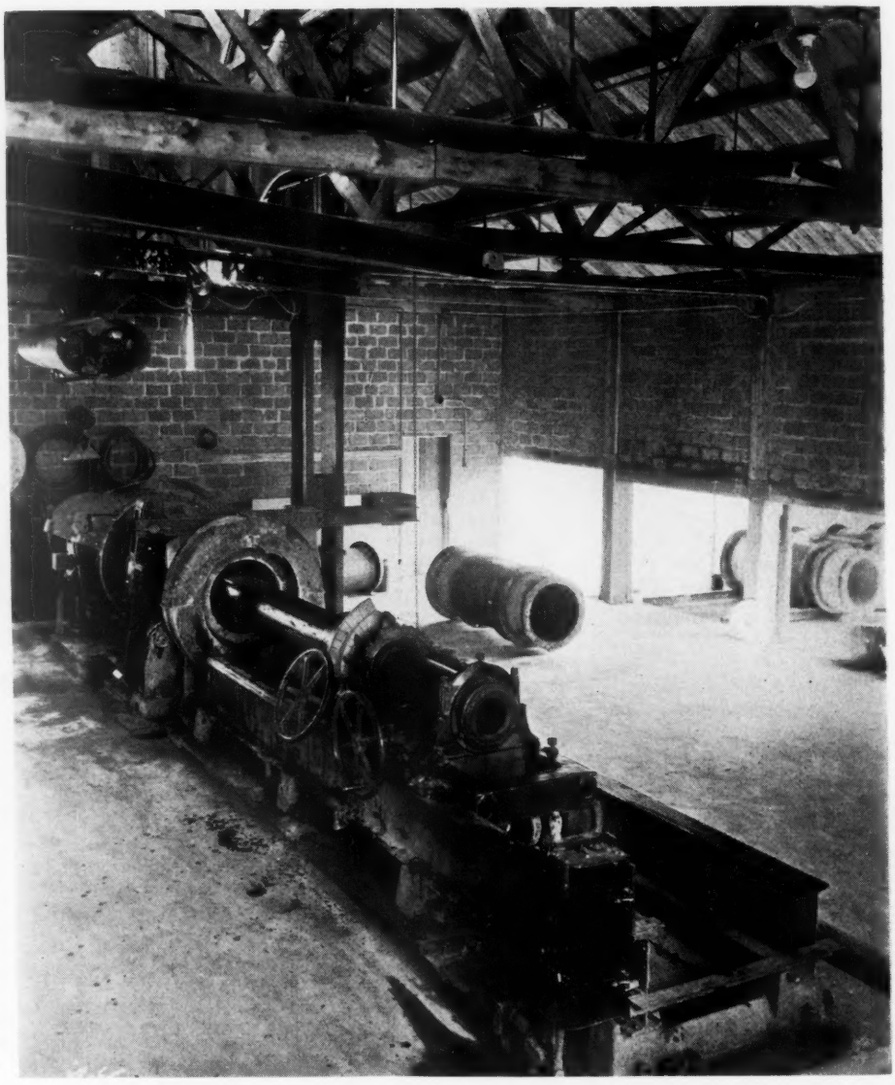
and the larger sizes by the Moir-Buchanan method, which comprises centrifugation with a knife finish. All the pipes made up to 24 in. dia. are of the bell and spigot type.

Delays in shipments of molds and machinery to the company held up operations and it was not possible to get the product into the market until late and near the end of the season. Nevertheless the company states that it was able to obtain several large contracts for sewer pipe. Contractors and engineers in the province are said to have been favorably impressed with the density, strength and impermeability of the pipe and with a large amount of municipal development work in project in Quebec, the company expects to increase production early in the year to meet the anticipated demand for its pipe.

Preparations are now under way at the plant to manufacture reinforced concrete water pipe for which there is an extensive market. The regular centrifugal process with a few modifications allows uniform reinforcement to be added to conform with any pre-determined pressure. The advantages of this type of pipe are said to be in their greater durability, economy in installation and maintenance and less loss of water by friction. The centrifugal action makes the inside of the pipe so smooth that it is almost as though it had been glazed, thus reducing resistance to flow.

The centrifugal process of concrete pipe manufacture under the Caron or Stac and Moir-Buchanan patents is new in Canada, but is said to have met with success in western Europe and Australia. In France there are about 10 plants using the Caron and Stac patents. The Consolidated company is planning the introduction of the processes for which they hold the Canadian rights in other provinces of the Dominion of Canada.

J. H. Sherrard is president of the company and H. T. Meldrum is secretary and general manager. Offices are maintained in the Canada Cement Co. building, Phillios square, Montreal.



Centrifugal machine for making concrete pipe at the Consolidated Pipe Co. plant at Montreal, Que. The machine as shown is set to produce 18-in. pipe

Concrete pipe plant and storage yard of the Consolidated Pipe Co., Montreal, Que.

Annual Report of Director of Bureau of Mines

THE sixteenth annual report of the director of the Bureau of Mines to the Secretary of Commerce for the fiscal year ended June 30, 1926, has just been released. It contains among other things a brief survey of the work performed by the bureau on non-metallic minerals. Many of the more important investigations have already been published in detail in Rock Products. The following is a list of some of the reports which are of interest to the rock products industries: "Rock-dusting of Coal Mines"; "Calcination of Small Sized Stone"; "Refractories"; "Limestone Mining"; "Metallurgical Limestone"; "Survey of Mica Industry"; "Quarrying and Use of Slate"; "Anhydrite as a Cement Retarder"; "Effect of Steam on the Calcination of Limestone"; "X-ray Studies of Plaster of Paris and Lime"; "Increase in Nonmetallic Research"; "Concentration of Fluorspar Ores"; "Flow of Heat Through Refractory Walls"; "Service Tests for Refractories."

Large Products Manufacturers in Pittsburgh District Merge

ANNOUNCEMENT is made in the Pittsburgh, Penn., *Post* of the formation of the largest cement products manufacturing plant in the United States through the merger of four of the largest producers in the Pittsburgh district. The new company will be known as the General Cement Products Corp. and will have a capitalization of about $1,000,000.

The companies entering the merger are the Henderson Structural Units Co., McKees Rocks; the Goldie Manufacturing Corp., Wilkinsburg; the National Concrete Block Corp., Woods Run, and the Cretestone Builders and Supply Co., Castle Shannon. The combined output of these companies comprises about 80% of the concrete building units made in and about Pittsburgh.

The corporation has taken offices in the Magee building, Pittsburgh, and the following officers have been elected: Robert G. Campbell, president; John E. Crawford, treasurer; C. J. Herzog, vice-president and manager of production; H. R. Loughridge, vice-president and manager of sales, and Albert Henderson, vice-president and chief engineer in charge of research and development.

Minnesota Concrete Stave Men to Meet in January

THE Concrete Stave Silo Association of Minnesota will hold a special meeting January 18 and 19 in Minneapolis, Ralph Worthley, president of the association, advises Rock Products.

The purpose of the meeting is to take up the difficulties encountered in manufacturing and erecting concrete stave silos, their solution, and arrangements made so that each company's product will be tested for absorption and strength, to which end a standard product has already been adopted at previous meetings held at Mankato, Minn., on November 26 and 27, and another at Minneapolis on December 15 and 16. The aim of members of the association is to put out the best possible product and to insure the purchaser of an A No. 1 standard quality of silos and other cement stave structures.

Mr. Worthley, the president, is connected with the Worthley Cement Crib and Silo Co. at Mankato. George Saffert, New Ulm, Minn., is secretary and treasurer of the association.

Getting at the Cost*

By A. W. DEVOS
Vice-President, Wisconsin Concrete Products Association

MANY manufacturers at this time of the year find that what they thought was a profitable year was not as rosy as it looked. They begin to wonder and ask where has the profit gone, and the more they figure the more they find out.

Too many concrete products manufacturers let some other concrete products manufacturer or some mason tell him what he should get for his product, and for lack of more definite information he accepts their suggestion and lets it go at that.

The concrete products industry is no longer one of those industries which can be run on a shoestring. Real money and real business methods must be used to put it where it rightly belongs. The concrete products manufacturers must adopt some system of cost finding, but in addition to cost of raw materials and labor, the subject of overhead expense is very important, and the discussion following treats with this subject entirely.

Let us stop to consider the importance and meaning of these words—Overhead Expense. Sometimes they are low, sometimes high. What items should be considered in this class? The following table contains about all the items, but of course each plant has its own particular problems. For the sake of simplicity we are classing the items under two heads as shown.

MANUFACTURING EXPENSE:
- Insurance (Fire, Liability, etc.)
- Light
- Power
- Water
- Gas
- Fuel
- Machinery Repairs
- Accrued Taxes
- Taxes Due
- Depreciation on Machinery
- Depreciation on Buildings

ADMINISTRATIVE EXPENSE:
- Office Salaries
- Advertising
- Automobile
- Automobile Oil, Gas and Insurance, Repairs, etc.
- Office (Telephone, Light, etc.)
- Membership Fees (Concrete Products Association, etc.)
- Donations
- Sales Expense
- Depreciation (Office Furniture)

After careful study of the above items we begin to wonder what ought to be the basis upon which we fix our selling price. To determine this, we must first know the actual cost of producing our product. How many of us are considering the cost of the unit merely (cost of material plus labor) divided by the number of units produced? But—is that the actual cost and can we base our selling price on that figure? What about that overhead expense? Taking that into consideration, to estimate the actual cost per unit of production, we must figure:

First—Cost of material (sand, cement, stone, etc.) plus the cost of labor.

Second—Total cost of overhead expenses.

Third—Total of first and second accounts and divided by the number of units produced.

This gives us a total cost per unit upon which we may base our selling price.

If each manufacturer will give this careful thought he will find that when reports for the year 1927 are made he will not be confronted with the question, "Why are my profits so small?"

Wisconsin Concrete Products Digest, December, 1926.

Plan Marbelite Plant for St. Louis

CONSTRUCTION on the first unit of Section No. 1 of the new plant, to be built at St. Louis, Mo., by the Marbelite Corp., with headquarters in Los Angeles, Calif., will be started within a short time, according to recent announcement made by Henry Barkschat, president of the corporation.

The building of the new plant at St. Louis, Mo., will mark the first step taken by the company in expansion beyond the Rocky Mountains, according to Mr. Barkschat. St. Louis was selected as the logical location for the new plant, as they expect to cover the field for ornamental concrete lighting standards, telephone poles and pilings between there and New Orleans.

The first section will be comprised of six buildings to be erected on a 10-acre site already selected along the river. It is expected that new buildings will be added from time to time as the business grows. The initial capacity of the plant will be from 70 to 100 lighting standards per day in addition to other products. Deliveries will be made by company barges or trucks.—*St. Louis (Mo.) Globe.*

Washington Concrete Products Plant Makes Changes

SO as to be in a position to make necessary additions and improvements to take care of its rapidly increasing business, the Auburn Concrete Products Co. of Auburn, Wash., is now being incorporated for $20,000, according to a report in the Auburn (Wash.) *Sentinel.* The company was established three years ago by C. M. Long, and has been under his sole guidance up to this time. It is now reported, however, that Hugh Boyd, Auburn, has taken an interest in the business and will join forces with Mr. Long.

Brief reference to changes the company had already made in line with its expansion program appeared in the December 11 issue of Rock Products. A lease was secured on a building three times larger than the old plant and the company has already moved into it. The new location is at Sixth street, S. E. All the necessary machinery for the production of the large variety of products the company manufactures has been installed in the new plant, including new equipment for the manufacture of "Stone Tile."

In addition to stone tile, the company manufactures a full line of concrete products, such as drain tile sewer pipe, septic tanks, culvert pipe, cement blocks and roofing tile, with sewer pipe representing the greater part of the output.

New Machinery and Equipment

New Light Tractor Shovel

THE Bay City Dredge Works, Bay City, Mich., announces a new light, small convertible excavator for general work, loading materials from stock piles, loading and unloading cars, etc. The machine is convertible to a crane or dragline and the power boom hoist mechanism is provided for either the shovel or crane.

This machine is built around the International McCormick-Deering tractor, which supplies the motive power and provides three propelling speeds—the fastest of which is three and a half miles an hour. All of the operating machinery is located on a revolving bull-wheel, which is above the machinery frame. The operator revolves with the machinery, which swings through an arc of 270 deg. The shovel can dig or load opposite the rear end of the crawlers. The machine is built throughout of special steel with alloy shafting; forged, heat-treated and machine-cut gears, and Timken roller bearings. The shovel will make, it is said, five bucket trips per minute. The machine is mounted on full-length steel crawler treads 9 ft. long, with tread rollers enclosed to keep out dirt. The operating machinery, gears and bearings, are also enclosed under a removable metal hood for protection from weather and dirt.

The machinery is one-man operated, and can be run on kerosene if desired. The shovel boom is 15 ft. long, permitting the shovel to cut at a height of 17 ft., or dump at a height of 15 ft. Crowding is accomplished by means of a steel worm and bronze worm gear running in oil and connected with the machine by shafts and gears. This crowd is reversible and self-locking.

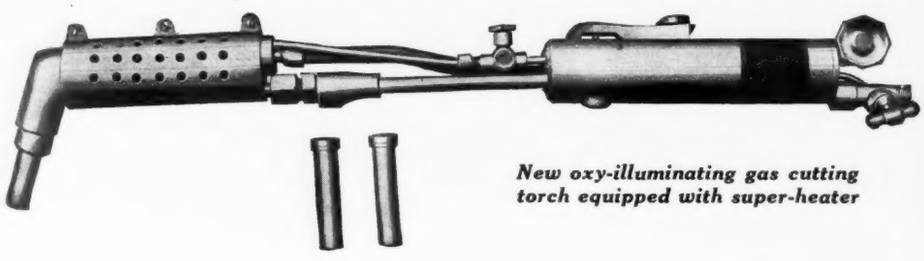
The dipper capacity is ⅜ cu. yd. water level measure, or practically ½ yd. heaped. The machine weighs 8 tons, and can be used, it is said to dig very hard material. Present optional bucket equipment includes shovel, clamshell or backfiller scraper.

New Gas Cutting Torch

THE Alexander Milburn Co., Baltimore, Md., has just placed on the market a gas cutting torch for use with illuminating and byproduct gases. One of the features claimed for the new torch is the super-heater which heats and expands the cutting oxygen, also the pre-heating gases, raising the temperature of the cutting oxygen to approximately 100 deg. C. prior to combustion. This increases the temperature of the gases at the torch tip, increases the rate of flame propagation in the burning mixture and also, it is said, reduces the oxygen consumption from 25 per cent upward.

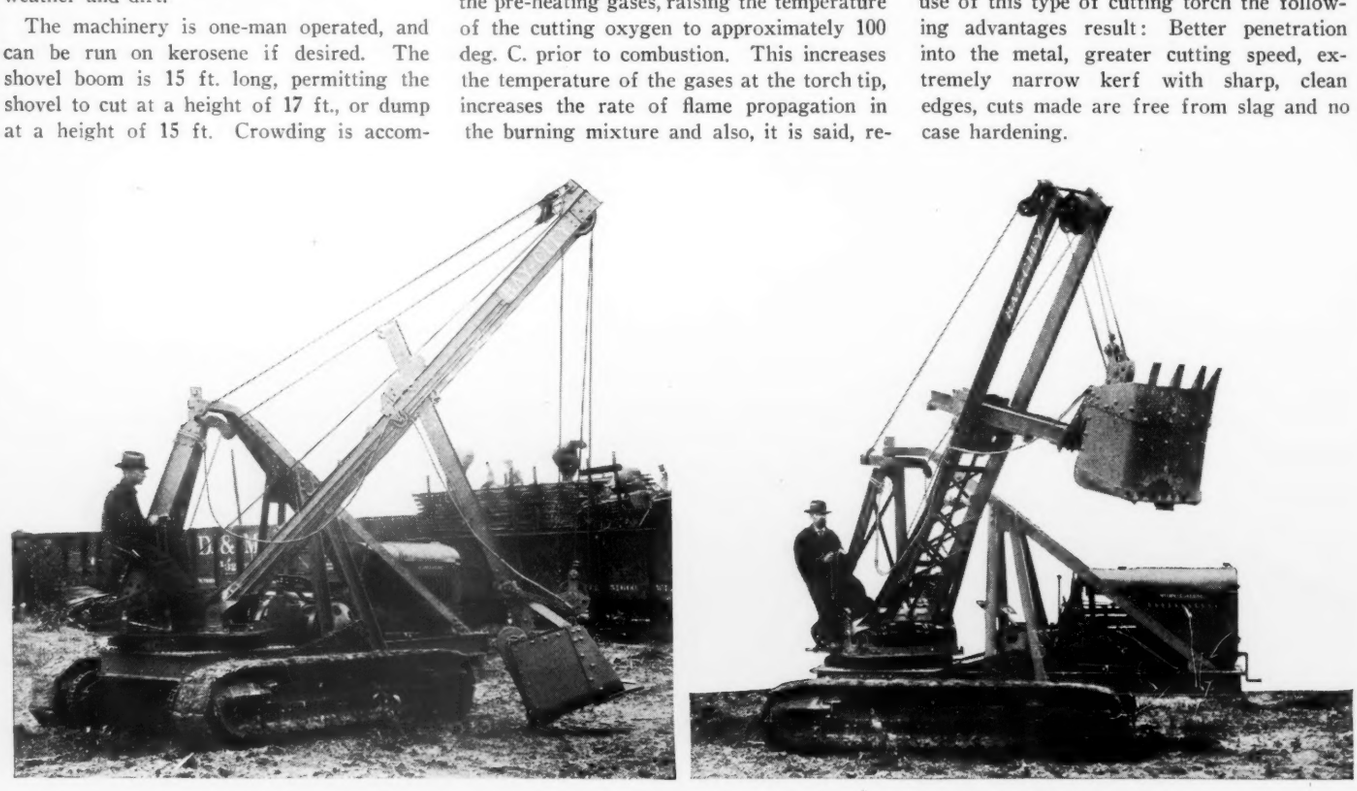
A bunsen burner, contained within the torch, burns illuminating gas which heats the cutting oxygen as it passes through a series of copper coils.

The torch is constructed of bronze forgings and specially drawn tubing. The high pressure cutting oxygen is controlled by a thumb valve which remains fixed in either open or closed position. The arrangement of the gas tubes gives the torch great transverse strength. It is substantially built, well balanced and easy to handle. The torch is 21 in. in length and is supplied with a complete range of tips for light, medium and heavy cutting.



New oxy-illuminating gas cutting torch equipped with super-heater

The manufacturers say that through the use of this type of cutting torch the following advantages result: Better penetration into the metal, greater cutting speed, extremely narrow kerf with sharp, clean edges, cuts made are free from slag and no case hardening.



Light, small convertible excavator for general work and loading to and from stockpiles and cars

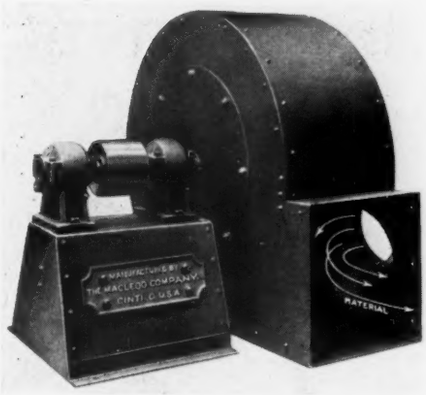
Exhaust Fan for Handling Pulverized Material

A NEW type of exhaust fan for handling powdered or fine ground materials such as limestone, cement, gypsum and others has been brought out recently by the Macleod Co., Cincinnati, Ohio.

This fan is somewhat different in that the material does not come in contact with the impeller, as in other designs, thereby, it is said, giving longer life to the fan and not becoming clogged or out of balance.

The material is brought through a projected inlet and discharged at right angles, the wheel being protected by a deflector plate. The only duty imposed on the impeller is the creating of suction by a centrifugal force, the air passing the inlet causing a high suction. Pressures up to 12 in. are said to be obtainable and the suction produced, it is claimed, will convey materials as far as the center inlet fan and with no additional power requirements. Each machine is said to be adjustable to over 30 different combinations and is also reversible.

Construction is almost entirely of steel, including the housing, bearing standard and wheel. Ball bearing pillow blocks are used on the drive shafts. The sizes of fan made range from 9 to 33 in. inlet diameter.



Adjustable exhaust fan for handling pulverized materials

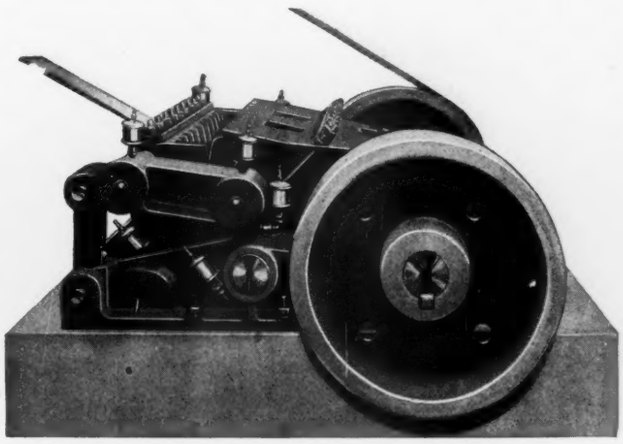
New Type of Fine Crusher

A NEW crusher designed for reducing material to 1½ in. and under is announced by the Horton Manufacturing Co., Minneapolis, Minn. The "Rock Hog," the manufacturers say, will operate on the rated capacity basis and produce uniform sizes with a minimum of fines. A new principle in crushing is claimed to be applied on this machine; that is, pressure crushing through pressure of the jaw combined with attrition action through another movement. Through improvements in design and structure, the manufacturers say, the weight of the new crusher has been reduced without affecting the crushing strength.

The crushing arrangement in the "Rock Hog" consists of a full floating jaw coupled to a rocking beam through four side links. Motion at the discharge end of the crusher is said to be small and a positive locking device holds the opening at the desired set. The system of leverages employed is figured to give a crushing ratio of about 20 to 1 and at the same time, it is claimed, cut down on the power requirements.

The breaker plates are reversible and can be removed and replaced in a short time. Flanges on one of the plates serve as cheeks, with the idea of reducing the weight of the manganese steel castings required and thus cutting the operation expense. Working parts are accessible and all bearings protected by a lubrication system. The beams are balanced, with the idea of relieving the eccentrics of their weight.

The present designs and sizes of the new crusher are all for reduction work. The three models on the market are as follows: 3-36S.F. for reducing 3-in. stone to 8 mesh; 4-36F.F. for reducing 3½-in. to ⅜-in., and the 7-36F.F. for reducing 6-in. to ½-in. The first model is of the semi-floating jaw type and the other two have the full-floating jaw.



New type of crusher for smaller sizes of stone

Has New Process for Making Gypsum Tile

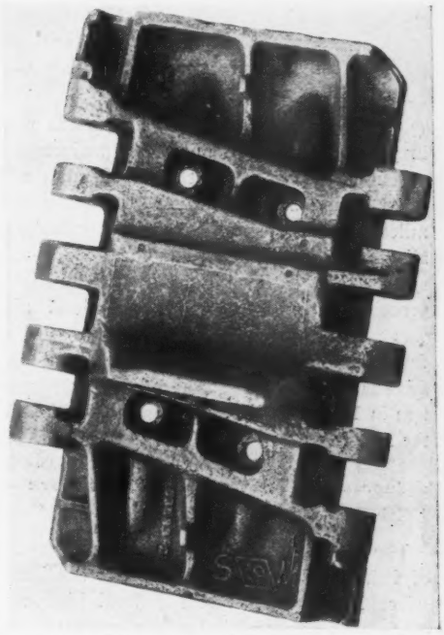
AN automatic gypsum tile machine has been perfected by L. R. Coffin of Los Angeles, Calif. The machine, which was formerly the property of the Gypsum Block Co., of which Mr. Coffin was sole owner, has been turned over to the Blue Diamond Co. of Los Angeles.

Tile is produced on this machine in any commercial size, with a thorough control of the mixture, consisting of the best grade of plaster and an imported long fiber sapless wood filler. The apparatus has a capacity of 1100 sq. ft. per hour. Ten men operate the entire plant.

In announcing this new machine the manufacturers make the statement that the material has been passed upon by the National Fire Underwriters as a Class A product after a test in which one side of the wall was heated to 2000 deg. F., with the other side registering 212 deg. It is also a non-conductor of sound and is being used for partitions in many of the height-limit structures in Los Angeles.

It is light, the 3-in. tile weighing 8 lb. to the sq. in., which is an important item in the load to be carried in big buildings, and also in handling during construction.

An outlay of approximately $100,000 is represented in the total investment of the plant, with $70,000 in equipment, according to the manufacturers.



Power shovel crawler shoe made of cast alloy steel

Machinable Manganese Steel and Alloy Castings

PARTS made of cast alloy steel or manganese steel, which can be machined, are announced by the Sivyer Steel Casting Co., Milwaukee, Wis. Many parts which are said to have been considered as unsuccessful when made by other methods or in other metals are now being cast, the manufacturers say, in Sivyer electric steel.

Electric steel castings made by the Sivyer method, it is said, can be also forged, welded and heat treated after machining. This, the manufacturers say, allows the use of a harder steel in the assembly without affecting machining costs. The heat treatment, it is said, is also easily handled and of little expense.

Such parts as ratchet teeth, motor truck housing, power shovel crawler shoes, etc., which require great strength and hardness, are said to have been successfully made by the Sivyer process and to have proven saisfactory both in the work they did and their length of life.

Federal Bureau Reviews 1926 Road Improvement Work

FEDERAL-AID road projects completed during the fiscal year 1926 contributed a net addition of 9,417 miles to the mileage of improved roads in the Federal-aid system, according to the annual report of the Bureau of Public Roads of the United States Department of Agriculture. Added to the mileage improved with Federal assistance in previous years, the above brings the total length of improved Federal-aid roads up to 55,902 miles.

At the close of the year construction was in progress on 10,962 miles and projects involving the improvement of 2,469 miles additional had been approved. Including the mileage of projects in these latter stages, all of which are included in the Federal-aid system, the total mileage improved or in process of improvement with Federal aid was 69,334.1 miles. With the exception of a few hundred miles improved prior to the designation of the Federal-aid highway system in 1921, all of this mileage is included in the system.

Increasing Traffic Necessitates More Road Improvement

The system now has an aggregate length of 182,134 miles. All this mileage has been selected by the State and Federal highway officials as essential links of a system adequate for the accommodation of inter-state traffic. Considerable work has been done on the system by the states without Federal aid so that it is now not far from three-fourths initially improved. The work of improvement, however, is not three-quarters done as increasing traffic will make it necessary to improve to a higher degree a considerable mileage of low-type road such as graded earth, sand-clay and gravel.

The report states that the improvement of several transcontinental routes is approaching completion. There is now a route extending from Washington through St. Louis, Texarkana, and El Paso, to San Diego which is 97 per cent improved. The route from Atlantic City, N. J., to Astoria, Ore., is seven-eighths improved, and from Boston to Seattle through the northern tier of states is 77 per cent improved and 69 per cent surfaced.

Twenty-five states have continuously improved highways entirely across them in at least one direction and 16 of these have completed trans-state arteries in two directions.

Road Construction Efficiency Increases

The report contains a short dicsussion on National Forest road construction, the relation of Federal-aid and forest road work, and also a review of the more conspicuous accomplishments in highway research. Among the investigations which have been of most practical value is that which was directed toward the increase of efficiency of various road construction operations, a field in which savings of from 25 to 35 per cent in earth-moving costs have been shown to be generally possible and in which it has been found that as much as 20 per cent can be saved in the cost of grading on some jobs, effected almost entirely by changes in design of grades. It has been shown that in concrete paving operations the daily output on most projects can be increased 25 per cent and sometimes 50 or even 100 per cent, some contractors having been able to reduce their bids surprisingly after having adopted improved methods suggested by the bureau. Investigations of the efficiency of different thicknesses of paving brick have brought out the possibility of great saving through the use of thinner brick which has been found to give equally satisfactory results with the thicker brick now in use.

Survey Helps Highway Administrators

Traffic surveys to show the utilization of various highways have been made in Connecticut, Maine, Pennsylvania, Ohio, California, and Cook County, Illinois, and similar surveys are to be made in New Hampshire and Vermont. As a result, valuable information is being collected as to weight and volume of traffic in all parts of the areas concerned, which with the traffic-flow maps enables highway administrators to prepare scientific budgets and to plan properly the improvement of the highway system. Such information places the highway program on a scientific basis.

Co-operative investigations are being carried on with various universities and state highway departments. Several of these aim to develop a suitable type of cheap surface for rural highways. Others aim to determine the tractive resistance of various types of highway surface, to measure the wind resistance of automobiles, and the tire wear of various surfaces and pavements. The bureau also carries on continuously examinations of highway materials for the purpose of checking the work, and various improvements have been made in testing instruments and in methods of testing.

Progress in Federal-aid construction in the various states is shown in the following table:

TOTAL COST, FEDERAL AID AND MILEAGE OF FEDERAL AID ROADS COMPLETED TO JUNE 30, 1926, BY STATES

State	Total Cost	Federal Aid	Miles*
Alabama	$ 20,752,585.99	$ 9,883,424.48	1,415.7
Arizona	11,529,325.07	6,250,194.69	767.1
Arkansas	20,257,932.75	8,543,898.76	1,418.5
California	30,235,379.81	14,558,628.81	1,169.7
Colorado	15,225,844.16	7,801,628.50	797.0
Connecticut	5,977,829.01	2,273,863.66	127.1
Delaware	4,918,052.29	1,781,665.60	124.3
Florida	7,989,517.80	3,878,287.87	249.7
Georgia	27,704,198.26	13,109,068.58	1,975.5
Idaho	11,780,741.23	6,325,103.42	773.7
Illinois	46,638,676.52	21,878,422.04	1,467.1
Indiana	22,596,658.46	10,900,346.83	687.2
Iowa	30,191,682.82	12,432,933.15	2,177.0
Kansas	34,446,612.82	13,356,124.78	1,263.6
Kentucky	21,319,134.37	8,742,516.65	687.4
Louisiana	14,281,859.04	6,359,336.43	1,069.8
Maine	8,747,552.76	4,192,507.39	303.6
Maryland	10,924,943.10	5,112,991.22	423.3
Massachusetts	19,217,639.13	6,898,383.20	385.7
Michigan	27,354,859.45	12,474,303.21	995.8
Minnesota	37,850,763.95	15,912,616.56	3,249.2
Mississippi	15,716,707.96	7,699,843.80	1,158.9
Missouri	37,571,342.54	17,289,927.52	1,795.7
Montana	11,914,279.06	6,607,530.55	1,071.5
Nebraska	14,379,018.01	6,868,788.86	2,021.2
Nevada	9,315,505.61	6,659,890.11	710.1
New Hampshire	5,260,569.51	2,510,351.32	244.6
New Jersey	17,680,844.26	5,378,542.37	307.9
New Mexico	13,200,059.12	7,851,157.91	1,490.5
New York	45,457,079.79	18,626,087.19	1,231.8
North Carolina	30,689,430.76	12,741,518.72	1,343.1
North Dakota	13,512,576.29	6,602,989.10	2,275.7
Ohio	49,367,650.24	18,074,453.82	1,422.6
Oklahoma	28,915,946.93	13,484,856.58	1,201.5
Oregon	17,612,858.41	8,945,203.93	961.6
Pennsylvania	74,812,072.67	25,106,966.83	1,435.2
Rhode Island	4,320,206.69	1,672,904.06	94.3
South Carolina	17,188,668.82	7,779,376.11	1,536.9
South Dakota	18,190,591.85	8,948,632.65	2,345.8
Tennessee	23,140,785.61	10,995,924.33	835.3
Texas	71,403,346.64	28,461,138.70	5,055.8
Utah	9,054,232.80	5,691,043.97	622.6
Vermont	4,273,969.26	2,028,484.51	135.2
Virginia	23,410,491.32	10,972,568.65	1,050.1
Washington	17,078,511.63	7,782,909.46	668.6
West Virginia	10,258,141.20	4,491,428.66	414.5
Wisconsin	25,353,034.20	10,638,396.73	1,619.1
Wyoming	12,383,388.08	6,977,481.63	1,225.1
Total	$1,051,403,098.05	$463,554,553.90	55,902.8

*Mileage is of original improvement only.

John J. Sloan, Past-President of the National Crushed Stone Association

NO soldier ever died in the service of his country more heroically than John J. Sloan, a past-president of the National Crushed Stone Association, died on January 5 in the service of his native city of Chicago, as its president of the Board of Local Improvements. His death is universally attributed to overwork and the persistency of his desire to finish his tasks and to serve the public long after he was in a physical condition that would have wholly discouraged a man less fearless and less enthused with the visions of a greater and more beautiful city to come.

In private life John J. Sloan was the secretary and general manager of the Wisconsin Granite Co., a quarry concern with a number of paving block and crushed-stone operations in New York state, Wisconsin and South Dakota. He was ever a helpful and supporting member of the National Crushed Stone Association and was president of the organization 1923-24; while at the same time he was actually devoting from 16 to 18 hours a day to his work as president of the Board of Local Improvements in the city of Chicago.

It was typical of the man that whatever he undertook to do he accomplished with a tireless energy and enthusiasm that would have done credit to a much younger man; which in the past few months of his declining health and physical weakness was nothing short of marvelous. It should be the pride of the quarry industry, of which John J. Sloan was a 100% disciple, that while the loss of his strong and vital personality and his helpful counsel will be deeply felt among his friends there, his loss to his native city is even more to be regretted.

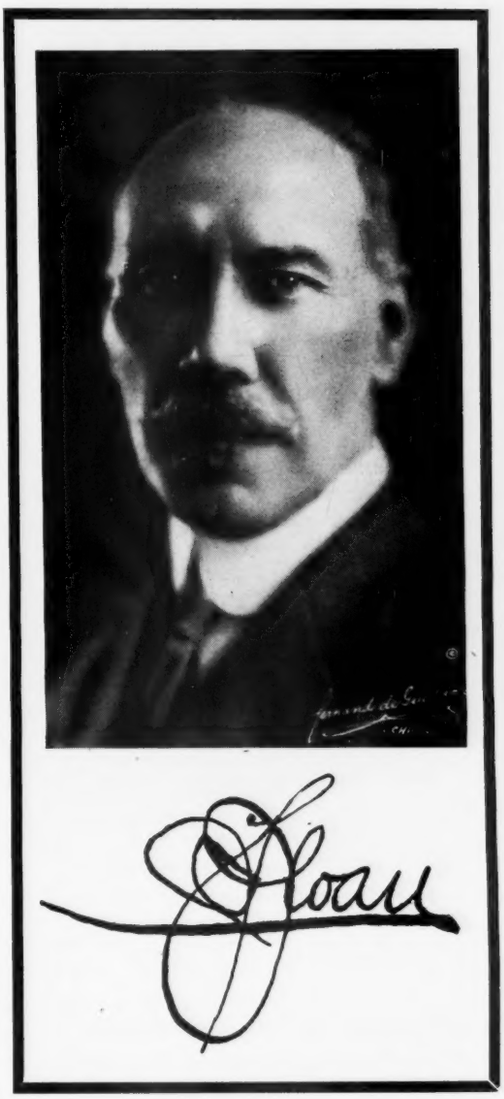
The *Chicago Tribune,* of January 6, in a dispatch from Biloxi, Miss. (dated January 5), where Mayor Dever of Chicago was enjoying a well-earned vacation, states: "The news (of Mr. Sloan's death) coming by telegram about 10:30 this evening depressed the mayor vastly. All day long he had been in jovial mood, tramping joyfully over the golf course, looking forward to another 10 days or so of sport and relaxation before going back into the heart of the campaign. Then came the telegram and sadness.

"'This shocks me inexpressibly,' Mr. Dever said. 'I don't know what to say. I was so fond of Sloan and I admired his great ability.'"

John J. Sloan was born September 29, 1868, on Chicago's west side, where he resided nearly all of his life. He attended the Holy Family parochial school, 12th and Morgan streets, and St. Patrick's academy. Later he went to night school at Armour Institute.

Finishing school, he went to Idaho to try his fortune in the gold mining industry. There he met with moderate success and returned to Chicago in 1892. In 1893 he was married to Miss Margaret Frederick.

Early in his career Mr. Sloan became interested in politics and was a Democratic leader in his ward. Appointed superintendent of the House of Correction in 1899, he attracted attention through the profitable sale of crushed rock for the city. On his resignation he was offered a position with the Wisconsin Granite Co., of which he eventually became the practical head.



Mayor Dever persuaded Mr. Sloan again to enter public life as head of the Board of Local Improvements in 1923. He was selected because he was personally known to the mayor as a man of fearlessness, of industry and integrity. The president of the Board of Local Improvements of the city of Chicago is the directing head of an engineering and public works organization which handles public improvements running into hundreds of millions of dollars in the course of a four-year term of office. When Mr. Sloan took the office it had been in the hands of a group of politicians for eight or more years, and was the center of about every known form of municipal graft—alliances of material interests and crooked labor union leaders, with thugery and thievery of the worst kind rampant. None but a man of fearless character would have taken the office except to become a helpless victim of the organization that had grown about this office.

John Sloan not only took the office and accomplished more in the way of vast permanent improvements for the city than his precedessors, but he cleaned house and established the public work of the city on a clean and business-like basis while he was doing it. He went into this work "feeling finer than he had ever felt in his life," as he once told the editor who writes this; but the task was probably greater than any man could have stood under with the same tenacity and fortitude, and eventually he broke under its strain—as true a martyr for the common welfare as ever died on the field of battle.

The principal achievement of his career is considered to be Wacker drive, Chicago, the $24,000,000 two level thoroughfare along the river, which he brought to completion last October, six months ahead of schedule and at a saving to the city of $500,000.

Mr. Sloan was unable to attend the dedication ceremony marking the finish of the work, but heard from his bed by radio the tributes paid to him by Mayor Dever and other speakers who called the drive a monument to his efforts.

We hope that the day is not far distant when the city will recognize his service and his sacrifice with such a monument as it erects to soldiers and statesmen who have done no more for their fellow citizens than did John J. Sloan.

Mr. Sloan is survived by a widow, Margaret Frederich Sloan, a married daughter, Mrs. Loretta Armstrong, and three sisters, Teresa, Nanette and May Sloan. The funeral was held at the family home January 8.

Why Illinois Furnishes Highway Contractors With Cement Only

Seven Reasons to Justify the Policy of State Purchases of Portland Cement

By Ralph R. Benedict
State Highway Department, Springfield, Ill.

A STATE highway department having a large construction program of concrete roads or roads with concrete bases, wherein portland cement is used in extensive quantities, will be financially better off if it furnishes the cement to its contractors. For the past 12 years Illinois has had contracts with the cement companies. These contracts are entered into the early part of January each year. We are fully convinced from our experience over this period of time that this arrangement with the cement companies has been the means of a substantial saving to the state; and cite the following reasons for our belief in the arrangement:

First. There is a substantial saving in price.

(a) The state gets the benefit of the retailers' handling cost which usually amounts to 10 cents per barrel.

(b) The cement is usually purchased at the beginning of the calendar year when the price is the lowest, due to inactivity of construction work.

Second. A supply of cement is insured in case of shortage during the construction season, thereby relieving the contractor of doubt or anxiety as to his ability to carry out his contract on schedule.

Third. The cost of inspection is very much less when the state has a contract with those companies in the best position to furnish cement. This does not mean that contract should be entered into with only one or two companies, but that the business should be distributed among those companies that are able to meet competitive freight rates.

Fourth. The allocation and delivery of cement to the various contractors is controlled by the state. Thus, the state is in a position to divert cement from other sources than the mill originally supplying the contractor, relieving the contractor of any shortage in the event he is in a position to increase his activities.

Fifth. Contractors are relieved of excess carrying charges on their contracts when the state furnishes the cement.

Sixth. State ownership of cement prevents a tendency to skimp in its use on construction work.

Seventh. The state is one of the best single customers of the cement companies from the standpoint of quantity purchased. Therefore there is a tendency to improve the quality by a more liberal compliance with the specifications than would be true if the mills were furnishing only a few individual contractors, even though the specifications were the same and the inspection was the same.

Discounting all of the other advantages, the saving in price alone would more than justify a state highway department in its policy of furnishing cement to contractors.

During the past five or six years Illinois has purchased annually from 2,000,000 to 4,000,000 bbl. of cement. The dealers' discount on this amount runs into large figures over a term of years.

Supplying Aggregate

What has been said of the advantages gained by state highway departments furnishing cement to contractors does not apply to all materials entering into road construction. We in Illinois have never been convinced that furnishing aggregate is a sound business proposition. The production of aggregate is not a specialized business as is the manufacturing of cement, and naturally there are many more producers and distributors in the market. Should highway departments furnish all of the materials entering into a road job it would mean that contractors would supply, practically, only the labor and machinery. This practice would be another objectionable instance of the state or government in business, and I am fully convinced that the contractors should be given the right to buy where they wish, taking the profit and any advantage in price they might be able to obtain. Also, furnishing of aggregates by the state would stifle competition between smaller producers who are in a position in numerous instances to supply materials for local jobs or contracts.

Conclusion

The diversified interests represented by the state highway departments present make it almost impossible to draw definite conclusions as to whether the state should furnish materials to contractors. There are so many physical conditions entering into the conduct of work in different parts of the country, and different conditions even in one state, that to make a hard and fast rule or to adopt any resolutions would lead us nowhere. However, as outlined in the opening paragraph of this paper, where a state has a program of sufficient magnitude to warrant its purchasing a commodity entering into road construction, such as cement, and where it can be shown that a large saving is effected, I am firmly of the opinion that it is sound business for the state to furnish such material to contractors.

*From *American Highways* for December, official publication of the American Association of State Highway Officials.

Building Crushed Stone Plant at Chico, California

ACCORDING to a recent item in the Sacramento (Calif.) *Bee*, J. E. Johnston, contractor, of Stockton, Calif., has commenced construction of a $150,000 crushed rock and gravel plant south of Chico. A crew of men recently started demolishing old buildings on the proposed plant site.

The new plant, it is said, will turn out 1000 tons of material a day. The product will be shipped for railroad ballast and for paving material. A spur track will be built to the plant.

Georgia Granite Company to Open New Quarry

THE W. T. Macken Granite Works of Sparta, Ga., one of the largest concerns quarrying stone in this section, is said to be planning the opening of a new quarry on company property owned near Granite Hill station, two miles or more from the city. The business of the concern is increasing to such an extent that the new quarry is needed to supply extra stone.

Negotiations are being made, it is stated, with the Georgia Southern Power Co. for a transmission line to run to the new quarry from the line passing through Granite Hill. —*Sparta (Ga.) Ishmaelite.*

F. M. Feiker to Direct A. B. P.

FREDERICK M. FEIKER has been appointed managing director of the Associated Business Papers, Inc., which has announced the inauguration of a more active policy and a broader program in the promotion and development of higher standards of journalism for the business press.

Mr. Feiker was born in Northampton, Mass., in 1881 and was graduated as an electrical engineer from Worcester Polytechnic Institute in 1904. He was first associated with the General Electric Co., and later joined the A. W. Shaw Co., where he established the magazine *Factory* and later was made chairman of the editorial board of *System and Factory*. In 1915 he went with the McGraw Publishing Co. as editor of the *Electrical World* and guided the early development of *Electrical Merchandising*, becoming eventually vice-president and editorial director of the McGraw-Hill Co. From 1921 to 1923 he was in Washington as assistant to Secretary of Commerce Hoover, and on his return to New York became operating vice-president of the Society for Electrical Development, which he now leaves.

ROCK PRODUCTS is a member of the Associated Business Papers, Inc., the A. B. P., so called, for brevity.

Reply to the Protest of Belgian Cement Makers

An Open Letter from the Cement Information Bureau, of New York City

EDITOR ROCK PRODUCTS:

THE letter from F. Van Ortroy, Secretary of the Belgian Trust which appeared in your issue of November 13, protesting your editorial on the foreign menace to the portland cement industry, is an argument in behalf of Belgian cement, rather than the offering of any facts to explain why a foreign product should be permitted to displace an American product in natural markets within the confines of its own territory.

Increasing Belgian Production

For three years this Belgian trust, whose methods are prohibited to American business men by our anti-trust laws, has fed on American prosperity. It is able to control production, allocate shipments and fix prices. Its production capacity has increased recently from 6,000,000 to 12,000,000 barrels per year because the United States has offered a field for large profit as Belgian consumption has not increased in proportion to its production. Production in this country can more than care for all domestic requirements and the American producer, forced to compete with a foreign material manufactured by cheap foreign labor, raises a warning signal to show our own people the inevitable result of this competition. This the Belgian regard as contrary to "fair play" and they regret "the tendency shown to close your frontiers to one of the products of our industry." And this is said while cement is on the free list and there is no possible method by which our frontiers can be clased to their product.

In the year 1922 Belgium exported to the United States 10,682 bbl. of cement. A year later it was over 200,000 bbl. In 1924 it was about 1,000,000 bbl. In 1925 the importations were nearly double that of 1924, reaching 1,911,745 bbl. and during the year 1926 Belgium will have exported to the United States more than 2,500,000 bbl. out of an estimated total of 3,500,000. Does this look as though the frontiers were closed?

Now that Belgian Cement is rapidly encroaching on our home markets by underselling in many cities of the Atlantic and Pacific seaboard, we seek to keep for the benefit of an American industry, markets within its own country that properly belong to it. Is that unfair?

The Belgian combined interests again bring forth the argument produced in the Anti-Dumping Case—that imports are such a small part of the total production of the United States as to be negligible. That is a misleading statement. In the City of Boston this year there was imported in the first ten months nearly 600,000 bbl. of cement, about 60% of total normal consumption, of which Belgium alone furnished over 450,000 bbl. In Philadelphia, Belgium supplied 404,128 bbl. during that time. Four million barrels of foreign cement were absorbed in a very restricted territory, entirely limited to seaports. Wherever low ocean freight rates permit, there Belgian cement is taking away the American markets. In this respect the invasion of foreign cement is disastrous, running from 15% to 60% of the consumption at coast points.

In 1920 our exports of portland cement amounted to 3,000,000 bbl. Last year the total was 1,000,000 bbl. and this year it will be less. Even exports to our own overseas territory have suffered disastrously. In 1920 we exported 204,769 bbl. to Hawaii. In 1925 the exports amounted to only 37,815 bbl. In the same year we exported 229,633 bbl. to Porto Rico and in 1925 only 122,516 bbl.

Facts of the Situation

Belgium's tariff is no more liberal than that of the United States. Both countries have cement on the free list, but Belgian schedules are in many cases high and, if it could be done with economic safety, they would be higher. The situation needs fact statements. These are that Belgium has sold 5,550,000 barrels of cement in the United States in the last three years; that Belgian labor receives but a fraction of what American labor is paid—about 90 cents to the Belgian laborer compared with $4.50 to similar American laborers; that Belgians through their cartels or comptoirs are able to enter into every imaginable agreement having to do with control of production, pooling of credits, allotment of sales territory, price agreements and so on which Americans cannot employ in competition because of the laws of the United States.

The Belgian goverment, like other European Governments, aids exporters by facilitating credits. Investment in cement plants and production costs are far less than in the United States. Internal freight rates are a fraction of ours. Atlantic cargoes from the east to the west are return cargoes taken at nominal rates which are less than average freight rates from our inland manufacturing points to our coastal cities.

The United States is not restricting imports or seeking unfairly to discriminate against the products of other countries. In the last fiscal year the total imports of all products to the United States were $4,466,000,000, an increase of 71% since our present tariff became effective in 1922. Of these imports 65% were free of duty.

What the cement industry and other industries insist on is that our industrial life be not undermined by unnecessary diversion of purchasing power to other countries, and these industries also insist that the things we can produce here should be produced here and that the domestic market be reserved for these commodities. In this we are moving in perfect step with the commercial and foreign trade policies of our European friends.

The National Republic Magazine says:

"What the American people have they have earned, under institutions providing more incentive and opportunity for human endeavor than has prevailed elsewhere in the world. They have accumlated their great natural wealth through production carried to such a point that they are turning out with six per cent of the world's population half the staples of the world industry. What is more important they have established a standard of wages and living, of reward for labor and productive enterprise, incomparably the highest in the world. They have achieved this through methods the rest of the world can emulate, if it will. The solution of the comparative poverty of the rest of the world is through adoption of our system of political unity, through the abandonment of international hatreds, prejudices and rivalries, largely of economic origin, through less politics and more production of the necessities of life. The solution is not in dragging Americans down to their level, but in rising to ours."

We welcome a presentation which gives us the opportunity to awaken the American mind to what foreign competition within the boundaries of the United States is going to bring to the American people. By our energy, by our thrift, by our efficiency, by our growing knowledge of how to fight for the international trade, this nation has built up a standard of living and a general prosperity which we intend to maintain and we shall use every honest means to combat a foreign invasion of cement when it endangers our national life, our standards of living and our national prosperity.

There certainly can be no impropriety in advocating the purchase of American cement of American consumers for the benefit of the American people.

CEMENT INFORMATION BUREAU,
25 Broadway, New York City.

U. S. Gypsum Co. Celebrates Its Twenty-fifth Anniversary

On January 4, executives and employes of the United States Gypsum Co., of Chicago, gathered at the Edgewater Beach hotel in Chicago to celebrate the twenty-fifth anniversary of the company. A feature of the occasion was an exhibit of the 38 gypsum products made by the company. Sewell L. Avery, president; O. M. Knode and C. F. Henning, vice presidents, and R. G. Bear were the principal speakers.

Slate Waste and Its Exploitation

By E. T. Ellis, F.J.I.
Sheffield, England

AT THE PRESENT TIME much less use is made of slate waste than should be made; and it will be interesting, therefore, and possibly helpful to quarry owners having large amounts of waste slate to deal with some outlets for it, and to cover so far as possible within the limits of a short paper its practical exploitation.

Six aspects of the exploitation of slate waste have been selected for discussion, although the number of available outlets is possibly four or five times this number. The particular six, however, about to be described are given on account of the fact that it is possible to manipulate them cheaply.

Sintered Slate as Road Stone

First of all I should like to draw attention to the fact that slate waste if strongly heated sinters, and instead of remaining in its original form, i.e., a comparatively soft mineral, it becomes intensely hard.

Sintered slate is, therefore, a very suitable material for use as road stone, especially on the smaller side roads and country lanes where a very cheap material is essential. The process of sintering slate is by no means difficult to manipulate, nor is it costly, and consists of heating the loose slate refuse in circular furnaces with coal, coke, or waste fuel, with a strong blast until the form of the refuse is entirely altered, i.e., until sintering is complete.

Samples are removed from the furnaces from time to time, and thus it is easy to see when sinterization has completely taken place. On this being noticed the furnaces are taken out of the series, the sintered slate slowly cooled, and then the lumps are passed through powerful breaking machines, and the new road stone graded to the different sizes required.

Sintered slate rivals the hardest possible blast furnace slag as a road metal, and can be almost as cheaply produced, in view of the fact that unlimited quantities of slate refuse are available.

Slate Bricks and Building Stone

Excellent bricks and building stone can be prepared from slate waste by either of two simple processes, and the use of this form of brick in house building and in the construction of factories, and even docks and harbor works is to be recommended.

The first process consists of grinding the waste to the form of fine powder, and making a paste of it with the smallest possible quantity of water. This paste is next filled into molds of different types, and submitted to great pressure in order to congeal the mass. The bricks or blocks of stone are then removed from the molds, and built up in kilns in which they are burnt in almost the same way as ordinary clay blicks, but at a rather higher temperature.

The second process is entirely different; although here again it is necessary to grind the refuse to the form of a fine powder. If this pulverized slate waste be now mixed with about 5% of oxychloride of magnesia, and then moistened with water and filled into molds, no heat and comparatively little pressure is needed to make hard bricks or building stone. It most cases the material sets into a hard lump in less than 12 hours, entirely of its own accord, but it is an important point not to use an excessive amount of water, otherwise setting may be somewhat slower.

Slate bricks and building stone prepared in this way are extremely dense, and last a long time. Oxychloride of magnesia is easily prepared, and by no means expensive, hence the cost of such bricks and building stone should compare very favorably with bricks made in the ordinary way, and building stone from quarries.

Slate Chips for Gravel

Very little treatment is required in the exploitation of slate waste for use as gravel, and yet one very seldom sees it so employed, it being preferred to pay an enhanced price for gravel from a distance, instead of using refuse close at hand.

To exploit slate chips as a gravel substitute the waste should be washed, and it may be necessary to boil it either with dilute mineral acid or dilute alkali in order to kill any vegetable growth which may have formed thereon during the long period in which the waste has accumulated on the spoil bank of the slate quarry. The refuse is then passed through various types of crushing machines and graded into three sizes—i.e., nuts about the size of ordinary surface road metal, chips similar to fine gravel, and slate sand for use as concrete aggregate.

Slate Dust as a Filler for Fertilizer

There are many chemicals which are too powerful to be employed alone, and which it is impossible to distribute over the soil in sufficiently small quantities. If, however, such chemicals be mixed with a diluent such as slate dust, the application is a very simple matter indeed, and it would pay owners of slate quarries, therefore, to grind the slate dust until it is as fine as the finest basic slag, and to sell it either alone or use in the manner indicated, or already mixed with active chemicals in the form of artificial manure. The two most important chemicals are, of course, sulphate of iron for increasing the density of the color alike of leaves and flowers, and crude naphthalene from the gasworks for pest killing. One ounce of the sulphate should be mixed with about a pound of fine slate dust, while in the case of the naphthalene 10% of the final mixture should consist of naphthalene, and either 90% of slate dust, or 60% of slate dust, and the remainder of furnace flue dust.

Slate Pencils from Unwanted Waste

Very few owners of slate quarries have considered the manufacture of slate pencils as a sideline, and yet, as a matter of fact this is a highly profitable way of exploiting unwanted waste.

The process consists of grinding the refuse, and mixing in from 10 to 20% of French chalk. After this it is necessary to moisten the mixture with a solution of waterglass (sodium silicate), and it is then molded into the form of rods, ¼ to ½ in. in diameter, and of any convenient length. Slow drying is an important matter, and when the rods have entirely lost their moisture, they are burnt in kilns in almost the same manner as are clay bricks.

Slate Powder as a Dentifrice

Even one of the smaller slate quarries should be able to produce sufficient dentifrice to serve the public for many miles round from its waste. This way of exploitation of slate waste is, therefore, recommended where the quarries are situated close to, or actually in, a large town or city.

The process of the exploitation of slate powder as a dentifrice is a comparatively simple one. It consists of washing, heating, and re-washing the refuse in the first instance, the object of the heating being to destroy any organic matter which may have formed on the waste during the period of its accumulation. It is next passed through mills of different types in order that it may be ground to an impalpable powder. Complete absence of grit is a very important matter, as although slate waste is comparatively soft, the presence of grit in a dentifrice is sure to damage the enamel of the teeth of the user, and if swallowed by accident may accumulate in the stomach or the intestines.

The impalpable powder is next mixed with from 30 to 50% of precipitated chalk, and 1% of the total mixture of carbolic acid is added, this being the purified variety, and not the ordinary crude commercial oily liquid. Various other additions may be made; thus up to 5% of oil or essence of peppermint, oil or essence of eucalyptus, or oil or essence of thymol may be mixed in with the slate dust and chalk. No doubt further research will show that a great many other essential oils can be used in addition, and combinations of several may be used to obtain special flavors. Finally the powder is slowly dried in an atmosphere of peppermint or whatever oil has been used as an addition; otherwise, of course, the vapor will be driven from the powder into the atmosphere. It is necessary to make these dentifrices up into tins immediately drying is completed, as they give off vapor very readily, and thus lose their effect.

News of All the Industry

Incorporations

Magnesia Co., Seattle, Wash., $50,000. W. E. Buell, Fred Furey and others.

Silica Sand Co., San Antonio, Texas, $40,000. G. H. Piper, Harry Hatch and others.

Valley Portland Cement Co., Goshen, Calif. Howard Throckmorton and others.

Weaver-Blank Sand and Gravel Co., Wichita, Kan., $10,000.

Fayette Rock Co., Lexington, Ky., $10,000. R. R. Smith, L. Tucker and R. T. Gunn.

St. Lawrence Marble and Tile, Ltd., Montreal, Ont., Canada.

Aldershot Sand and Crushed Stone Co., Ltd., Hamilton, Ont., Canada, $40,000.

Concrete Pipe Co., Portland, Ore., has decreased its capital stock to $200,000.

Auburn Concrete Products Co., Inc., Auburn, Wash., $20,000. C. M. Long, A. H. Boyd and W. R. Ritchie.

Twig Concrete Products and Gravel Co., Inc., Duluth, Minn., $100,000. L. R. Bussa, M. D. Hoffatt and others.

Sand Springs Lime Co., Sand Springs, Okla., $5000. J. S. Greer, Rosie Tracy and Loraine Greer.

Eureka Limestone Co., Asheville, N. C., $100,000. H. Fleming, Hot Springs, C. E. Bonesteel, Asheville, and L. Blankenship, Lexington, Ky.

Improved Brick and Stone Co., Wilmington, Del., $500,000. To manufacture brick, stone and building materials of all kinds.

Agricultural Lime Corp., Inc., Dover, N. J., $700,000. Mark W. Cole, Dover. (Corporation Trust Co. of Delaware.) Limestone, rock, sand.

J. S. Lackland, Atho Lipes and associates, Buchanan, Va., $50,000. To manufacture concrete pipe and other concrete products.

Canada Gravel and Sand Co., Ltd., Toronto, Ont., Canada, $40,000. To quarry, mine and deal in sand, gravel, cement and crushed stone.

Howell J. Davis, Kingston Park, and **J. Ross Hanahan**, 21 Meeting street, Charleston, S. C., $1,750,000. To manufacture portland cement.

Buhrman Sand and Gravel Corp., New York City, $175,000. F. W. Buhrman, A. S. Bayles, H. S. Weller. (Filed by Weller and Rogers, Jamaica.)

Little Rock Stone Co., Little Rock, Ark., $75,000, $25,000 subscribed. 3000 shares with par value of $25 each. J. W. Carmean, president and treasurer; Frank Carmean, vice-president, and Frank Carmean, Jr., secretary.

Quarries

W. E. Simpson, St. Louis, Mo., recently purchased 160 acres of marble land, located near Shipps Ferry, Ark., from Robert Dittman, also of St. Louis. The price was $400.

Lannon Quarries Corp., Beaver Dam, Wis., recently incorporated for $50,000 as announced in the December 11 issue of "Rock Products," will be operated under lease by the Central Lumber and Supply Co..

Indiana Limestone Co., Bedford, Ind., which recently suffered a $100,000 loss in its warehouse and plant in Oolitic, Ind., will rebuild at once. D. H. Johnson, assistant vice-president, is in charge.

Sand and Gravel

Bedford-Nugent Co., Evansville, Ind., is reported to have placed an order with the Jones and Laughlin Steel Co., Pittsburgh, Penn., for the construction of two barges, each to be 110 ft. long, 28 ft. wide and 7 ft. deep.

Georgetown Gravel Co., Georgetown, Ga., has opened a sales office in Atlanta, Ga., at 302 Healey building. E. H. Boyd is in charge of the office and will handle the company's sales.

Gadsden Sand and Gravel Co., Gadsden, Ala., recently organized with a capital of $50,000, is reported to have started operations at its plant recently. The company will ship building sand, molding sand and gravel to all parts of the south. Its sand beds are located in East Gadsden. Felix Bowman is president.

Lime

Orcas Lime Works, Seattle, Wash., is said to have completely electrified its plants located near Roche Harbor. The equipment was furnished and installed by Charles Churchill, a local electrical engineer.

Gypsum

United States Gypsum Corp., Chicago, Ill., according to reports, is planning extensions and improvement to its plant at Loveland, Colo., which will cost approximately $300,000 with machinery.

Pacific Portland Cement Co., Consolidated, San Francisco, Calif., has been forced to temporarily close its gypsum plant at Plaster City while the railroad tracks from the plant to the gypsum mines, which were almost entirely washed out by recent floods, are repaired and hauling of crude gypsum can be resumed. The company, it is said, is rushed with orders which cannot be filled because there are no materials at the mill to crush. The Pacific company also has a gypsum plant at Gerlach, Nev.

Cement

Lawrence Portland Cement Co., Northampton, Penn., expects to have the plans for its proposed branch plant at Thomaston, Maine, completed about January 15 and will start work immediately, it is said. The entire project will cost more than $1,500,000 with machinery. Reference to the proposed plant has been made in the November 27 and December 11 issues of "Rock Products." Frank H. Smith is president.

Coplay Cement Mfg. Co., Coplay, Penn., the oldest company in the portland cement industry in the Lehigh Valley, have authorized the Hooper-Momberger Co., 90 West street, New York, to dispose of the surplus material and equipment consisting of crushers, ball and tube mills, of well known makes, which are replaced by machinery of the very latest design and of larger capacity. Due to the super power changes on the eastern coast, the 25 cycle motor plant has been changed to 60 cycles as well as the transformer installation.

New Egyptian Portland Cement Co. is said to be moving its plant at Holly, Mich., to a site east of the city.

Canada Cement Co., Ltd., Montreal, Quebec, Canada, is reported to be building a new plant at Lakefield, Ontario.

Pennsylvania-Dixie Cement Corp., Chattanooga, Tenn., has opened a district office at 517 Barnett National Bank Bldg., Jacksonville, Fla. The office is in charge of D. R. Curtis, who had been with the Dixie Portland Cement Co. for 17 years.

Cement Products

Earl Adams, Gold Hill, Ore., it is reported, is installing equipment for the manufacture of cement products and ornamental brick and cement blocks.

Gouverneur Limestone Co., Gouverneur, N. Y., report that they are planning to enlarge their cement products department next spring to meet the increasing demand. The company manufactures tile, brick cement building blocks and fence posts. A. W. Temple is in charge of the department.

Home Builders Supply Co., Swanton, Ohio, has purchased the cement block factory of Zeller & Son, a local concern.

Charles and Herman Morris, who are engaged in the manufacture of cement burial vaults at Sharon, Wis., have opened up a branch factory at Delavan, Wis., so as to meet increased demands.

Washington Mantel Co., Seattle, Wash., manufacturers of tile mantels of conventional and made-to-order designs, have moved from 3915 Brooklyn Ave. to 3425 Stoneway. H. L. Langtry and S. P. Ostermeyer are the proprietors.

Collier Duntile Products Co., Donna, Texas, started operations at its plant recently, according to reports. The present capacity is about 2000 tile per day.

E. F. Reese, Kennewick, Wash., is reported to have recently opened a cement products factory here, for the purpose of manufacturing all kinds of cement products, specializing in irrigation pipe and building blocks.

Luigi and Guido Manzani have engaged in business at 967 North Broadway, Los Angeles, Calif., as the Los Angeles Terrazzo and Cement Works.

Readymix Mortar Co., Seattle, Wash., has changed its name to the Mutual Mortar and Material Co.

Gonzales Cement Works, Gonzales, Texas, is contemplating the construction of a branch plant in San Antonio for the manufacture of concrete sewer pipe, machinery to be electric driven. The plant, it is estimated, will cost $70,000.

Acme Stucco Co. has engaged in business at 1566 Howard street, San Francisco, Calif., according to a report.

Pueblo Cinder and Cement Products Co., Pueblo, Colo., is contemplating the erection of a one-story addition, 30x120 ft. A portion of the structure will be equipped as a repair shop, it is said. L. W. Crenger is general manager.

W. A. Ross Construction Co., Kansas City, Mo., expects to start work on the erection of its proposed new central concrete mixing plant about January 10, it is said. Reference to the company's plans for this plant was made on page 98 of the November 27 issue of "Rock Products." The estimated cost of the plant is $250,000.

Orlando, Fla.—The Duntile Manufacturers Association of Florida was organized recently at a state-wide meeting of duntile manufacturers held in this city. E. A. Hoselton of Orlando was elected president of the association. Addresses were given at the meeting by L. F. Fletcher, building inspector of Orlando and president of the Florida Builders' conference; N. M. Stineman, of the Portland Cement Association's Chicago office; T. B. Douglas, of the association's Jacksonville office, and R. P. Thornton, of the Southern Testing Laboratories of Tampa. There are said to be 25 "Duntile" manufacturing plants in Florida. State headquarters for the association will be decided upon later by a special committee.

Rock Asphalt

Rock Asphalt Co., Wichita, Kan., is reported to have tentative plans under way for a new asphalt manufacturing plant, to cost about $50,000 with equipment. George H. Bradford is president.

Miscellaneous Rock Products

Abb Landis, 1110 Indiana Life building, Nashville, Tenn., has acquired the properties of the Asbestos Mining and Manufacturing Co. of Hollywood, Ga., and will operate under the name of Hollywood Asbestos Mines.

American Fertilizer and Chemical Works, San Saba, Tex., of which Thomas F. Hawkins of Georgetown, Tex., is president, will erect a $30,000 plant for the manufacture of fertilizer, lime, etc.

Personals

S. W. Busset, Oakland, Calif., announces that he has acquired the local sales rights for the product of the Pacific Coast Wall Co., Oakland, manufacturers of a gypsum reinforced inside partition.

Fred D. Hatfield, director of safety of the Indiana Limestone Co., Bloomington, Ind., outlined safety advances made in the stone quarries of Indiana during the past 18 months at the recent meeting of the statewide safety conference held in Indianapolis.

Dr. M. L. Hartmann has resigned as director of research of the Carborundum Co., Niagara Falls, N. Y., to become technical director of the Celite Products Co., whose research laboratory is located at Lompoc, Calif.

Dr. Hartmann is a graduate of the University of Arizona, and received his doctorate degree from Harvard University. He was formerly head of the department of chemistry, South Dakota State School of Mines, and has for the past nine years been in charge of the research department of the Carborundum Co.

Clarence (Sandy) Pratt, president of the Pratt Building Material Co., San Francisco, Calif., who has been "Mayor" of Westwood Park, a suburb, for the nine years he and his family lived there, has just moved into a new home at Monterey Heights and is now said to be "Mayor" of that place. The question that attorneys and politicians are now trying to decide is: Can Sandy hold down the office as "Mayor" of Westwood Park and still chlaim the "Mayor's" office in exclusive Monterey Heights? Pratt also claims to be "Mayor" of Prattco, Monterey county, and Prattrock, near Folsom. where he has sand, rock and gravel producing plants.

George O. Gray, formerly connected with the Three Forks Portland Cement Co., Denver, Colo., is now vice-president and sales manager of the Western Wallboard Co., Seattle, Wash., which company has taken over the sales of Hanover plaster, manufactured by the Three Forks company, for the states of Washington, Oregon and Idaho.

Al. W. Scarratt has been appointed assistant chief engineer of the Hyatt Roller Bearing Co., Newark, N. J. Prior to joining the Hyatt organization, Mr. Scarratt spent 13½ years with the Minneapolis Steel and Machinery Co., Minneapolis. Mr. Scarratt was one of the organizers of the Society of Tractor Engineers in Minneapolis, and a prime mover in merging that organization with the Society of Automotive Engineers. He has served as councilor, vice president of tractor engineering, and as secretary of the Minneapolis section of the S. A. E., which office he still holds, and has also served on various standards committees of the society.

Obituaries

Benjamin F. Adams, for many years identified with the crushed stone industry in Indiana, died recently while in a taxicab in Chicago. Mr. Adams, who was 64 years old, and his brother, W. H. Adams, some time ago sold the Monroe County Oolitic Stone Co., south of Bloomington, Ind., in a merger for $700,000. They started the Bloomington National Bank several years ago. Mr. Adams was a graduate of Indiana University at Bloomington and was treasurer of the alumni association for several years.

Manufacturers

Timken Roller Bearing Co., Canton, Ohio, reports the following personnel changes: Paul Ackerman, to the position of enginer, service department, with all service work of the automotive, industrial and steel mill divisions coordinated under his direction; J. H. Ridge to the position of manager of the Pittsburgh, Penn., branch and G. G. Weston to the position of manager of the Omaha branch.

Mundy Sales Corp., New York, N. Y., announces the appointment of the George W. Ziegler Machinery Co., 528 First Ave., Pittsburgh, Penn., as exclusive distributors for Mundy hoisting equipment, including the new patent three-speed hoist.

E. W. Bassick, Detroit, Mich., and associates have acquired the capital stock of Service Motors, Inc., to take care of the expanding business and to further carry on the development of the "Relay Axle" equipped truck. The Service plant at Wabash, Ind., is of the modern type of construction, designed and built for the efficient production of motor vehicles. The plant has a floor space of approximately 250,000 sq. ft., giving a capacity of 10,000 to 12,000 trucks per year. A new corporation will be formed, consolidating the Service company with the Commerce Truck Co., Ypsilanti, Mich., of which E. W. Bassick is president.

Barber-Greene Co. has opened a new office at 2045 Main St., Kansas City, Mo., with E. H. Cooper, district manager, in charge.

Ideal Concrete Machinery Co., Cincinnati, Ohio, announces the appointment of Wylie Bros., Inc., 511 West Main St., Oklahoma City, Okla., as its representatives for that state.

Koppel Industrial Car and Equipment Co., Koppel, Penn., has recently completed a new bulletin on quarry cars, track and track equipment, which will be ready for distribution at the National Crushed Stone Association Detroit convention.

James L. Mayer and Frederick E. Oswald announce the opening of a sales office for industrial engineering equipment at 332 South La Salle St., Chicago, Ill. They are now representing the Dings Magnetic Separator Co. and the Saginaw Stamping and Tool Co., manufacturers of pressed steel overhead conveyor wheels, trolleys and casters.

Sullivan Machinery Co., Chicago, Ill., are planning an interesting exhibit of its equipment at the 1927 Road Show. J. H. Brown, Chicago district sales manager, will be in charge of the exhibit and will be assisted by different members of the sales force.

Electric Controller and Mfg. Co., Cleveland, Ohio, announce the removal of its Toronto office from the Traders Bank Bldg. to 415 Metropolitan Bldg., Toronto, Ontario.

Lakewood Engineering Co., Cleveland, Ohio, announces the appointment of the Superior Supply Co., Webster building, Chicago, distributors of their equipment in the river counties of Iowa, northern Illinois and the northwest portion of Indiana. A. N. Herrick, manager of the Chicago office now closed, continues as district supervisor for the central west territory, headquarters with the Superior Supply Co.

Stephens-Adamson Mfg. Co., Aurora, Ill., announce the opening of a branch sales office at 472 Hanna building, Cleveland, Ohio, with J. G. Stewart and J. L. Langner in charge.

General Electric Co., Schenectady, N. Y., announces the following elections: Theodore Beran of New York, H. L. Monroe of Chicago and J. A. Cranston of San Francisco as commercial vice-presidents, in charge of the commercial activities of the company in the New York, central and Pacific coast districts respectively, and E. W. Allen, vice-president, in charge of engineering, with offices in Schenectady. On account of the temporary absence of Vice-President F. C. Pratt because of illness, G. E. Emmons, former vice-president, was elected as acting vice-president to take charge of manufacturing activities.

Westinghouse Electric and Mfg. Co., East Pittsburgh, Penn., announce the merger of the Westinghouse Electric Products Co., Mansfield, Ohio, and the George Cutler Co., South Bend, Ind., both subsidiaries of the company, into the parent company as branch works.

Burke Electric Co., Erie, Penn., announces the appointment of H. C. Lemire, 407 South Fourth street, Minneapolis, Minn., as district sales agent for Minnesota, the Dakotas and the northern portion of Wisconsin.

Sullivan Machinery Co., Chicago, Ill., announces the removal of the Butte, Mont., offices to 54 East Broadway. J. G. Graham is in charge.

Trade Literature

NOTICE—Any publication mentioned under this heading will be sent free unless otherwise noted, to readers, on request to the firm issuing the publication. When writing for any of the items kindly mention ROCK PRODUCTS.

General Electric Bulletins. GEA-578 on mechanical drive turbines; **GEA-528** on centrifugal air compressors; **GEA-556** on automatic welding head and control.

Limit Stops and Automatic Compensators. Bulletin **1037-C** describing type "B" limit stops for use with alternating and direct current motors on electric cranes and any other motor driven machine which must be automatically stopped when reaching a given position. Bulletin **1042-F** describing automatic compensators for 110 to 550 volts a.c. squirrel cage and synchronous motors. ELECTRIC CONTROLLER AND MFG. CO., Cleveland, Ohio.

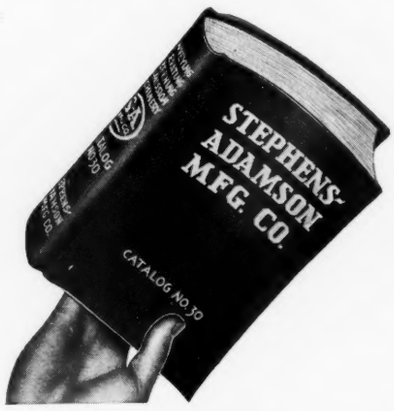
Roller Mills, Air Separators, Etc. Catalog No. 18 on Raymond roller mills equipped with air separators, automatic pulverizers with air or screen separation, vacuum air separating plants, special exhausters, dust collectors and accessories. Illustrations and details of design. RAYMOND BROS. IMPACT PULVERIZER CO., Chicago, Ill.

Refractory Cement. Bulletin on "Grefco," high temperature chrome cement made by GENERAL REFRACTORIES CO., Philadelphia, Penn.

Oil Engines. Bulletin No. **400** on the type "D," model "M" four cylinder Venn-Severin oil engine. Data on construction, operation and design. VENN-SEVERIN MACHINE CO., Chicago, Ill.

Drag-Line Bucket. Bulletin No. **666-A** on new bucket equipped with Van Port reversible and replaceable teeth. THE HAYWARD CO., New York, N. Y.

Material Handling Machinery. General catalog No. **30,** a complete listing of S-A machinery, standard and special, as designed for material



New bulletin on material handling equipment

handling purposes. Blue prints and drawings showing typical arrangements. Tables of specifications, sizes and prices. New data on design, capacities and power requirements of all classes of conveying and elevating machinery and correlated listings of machinery units. 960 pp. STEPHENS-ADAMSON CO., Aurora, Ill.

Huber Stokers. Bulletins listing some economies obtained through use of efficient mechanical stokers. FLYNN & EMRICH CO., Baltimore, Md.

Fans and Blowers. Bulletin No. **8001** describing and illustrating "Sirocco" fans and blowers. Data on design, arrangement, capacity tables, etc. AMERICAN BLOWER CO., Detroit, Mich.

Gasoline Hoists. Bulletin No. **8** describing and illustrating single and double and three friction drive gasoline hoists, concrete tower hoists, gasoline mine hoists and others. Construction details, capacity tables, etc. LIDGERWOOD MFG. CO., New York, N. Y.

Super-Refractories. Booklet describing manufacture of "Kruzite" and "Mizzou" high alumina liners for use in portland cement and lime kilns. A. P. GREEN FIRE BRICK CO., Mexico, Mo.

Sling Chains. Bulletin on types and varieties of single and double sling chains. Includes data and tables on safe working loads, suggestions for use and price lists. S. G. TAYLOR CHAIN CO., Chicago, Ill.

Car dumping and handling equipment. Bulletin No. **86** illustrating rotary car dumpers, car feeder installations, sproggers, Rand's "Weighbasket" and other equipment. ROBERTS AND SCHAEFFER CO., Chicago, Ill.

Dredging Projects. New bulletin describing several outstanding dredging projects of land and marine type. Pontoon tanks, automatic welding processes and table of safe working loads for various diameters and gauges. Illustrates various types of special steel dredge pipe, elbows, flanges, etc. THE AMERICAN ROLLING MILL CO., Middletown, Ohio.

Pinion Puller. Bulletin illustrating and describing Duff pinion puller—No. **55.** DUFF MFG. CO., Pittsburgh, Penn.

The Mico-Scope. First issue of a monthly house organ published by the McMYLER-INTERSTATE CO., Cleveland, Ohio.

Spur Gear Speed Reducers. Catalog No. **26** describing and illustrating complete line of Jones spur gear speed reducers. Details of design and operation, data on miscellaneous applications, operating instructions, tables of horsepower ratings, construction, etc. W. A. JONES FOUNDRY AND MACHINE CO., Chicago, Ill.

General Electric Bulletins. GEA-451 on the **MT** control system for direct current motors; **GEA-548** on pedestal bases for vertical motors.

Winter Construction Tools. Bulletin No. **52** illustrating and describing concrete heaters, thawers, mortar heating pans, salamanders, water heaters, furnace burners, etc., for use in winter construction work. AEROIL BURNER CO., INC., Union City, N. J.